Ontario

ENVIRONMENTAL ASSESSMENT BOARD

VOLUME: 102

DATE: Wednesday, May 10th, 1989

BEFORE: M.I. JEFFERY, Q.C., Chairman

E. MARTEL, Member

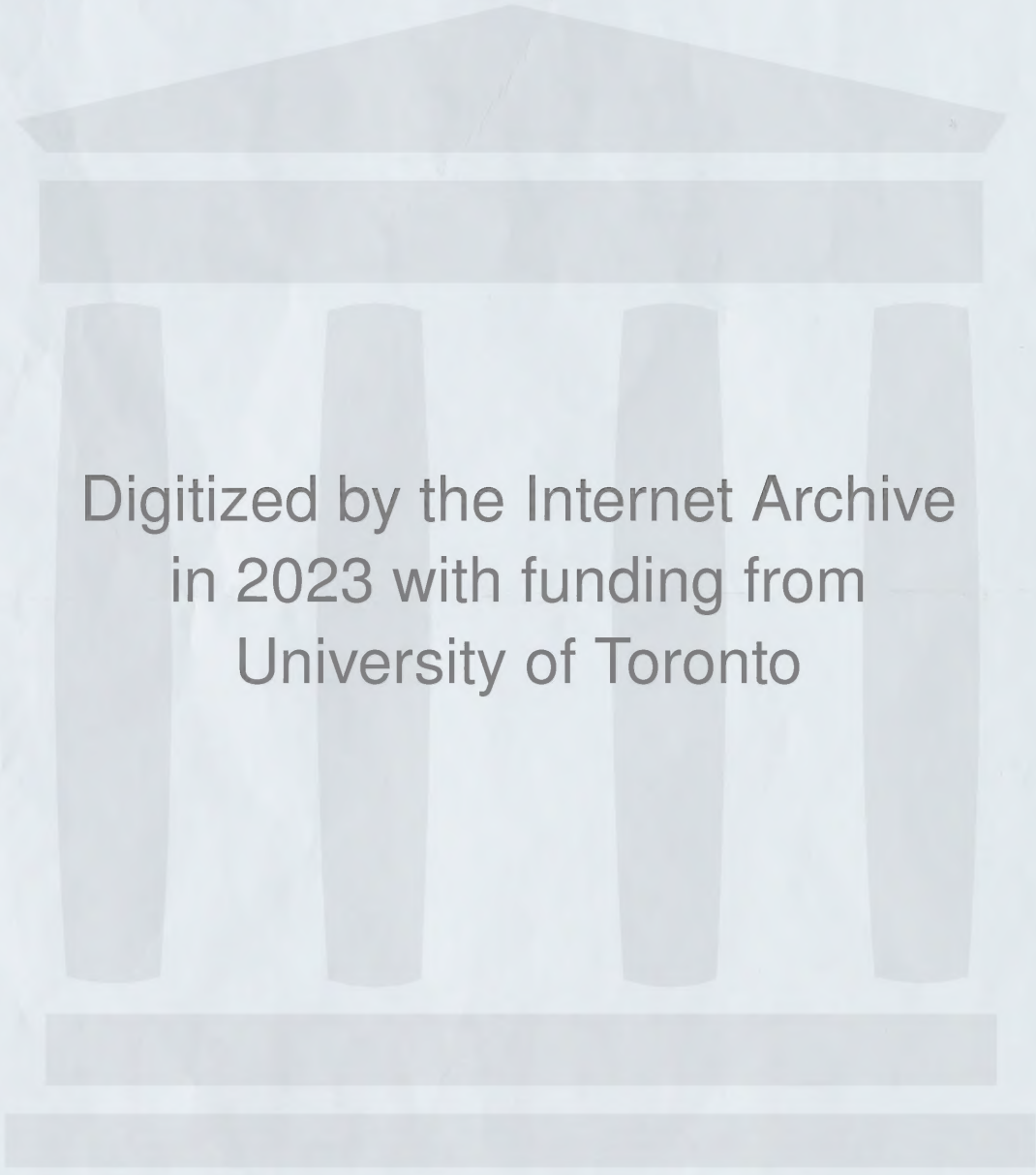
A. KOVEN, Member

FOR HEARING UPDATES CALL (TOLL-FREE): 1-800-387-8810

FARR & ASSOCIATES REPORTING INC.

(416) 482-3277

2300 Yonge St., Suite 709, Toronto, Canada M4P 1E4



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EA-87-02

HEARING ON THE PROPOSAL BY THE MINISTRY OF NATURAL RESOURCES FOR A CLASS ENVIRONMENTAL ASSESSMENT FOR TIMBER MANAGEMENT ON CROWN LANDS IN ONTARIO

IN THE MATTER of the Environmental Assessment Act, R.S.O. 1980, c.140;

- and -

IN THE MATTER of the Class Environmental Assessment for Timber Management on Crown Lands in Ontario;

- and -

IN THE MATTER of an Order-in-Council (O.C. 2449/87) authorizing the Environmental Assessment Board to administer a funding program, in connection with the environmental assessment hearing with respect to the Timber Management Class Environmental Assessment, and to distribute funds to qualified participants.

Hearing held at the Ramada Prince Arthur Hotel, 17 North Cumberland St., Thunder Bay, Ontario, on Wednesday, May 10th, 1989, commencing at 8:30 a.m.

VOLUME 102

BEFORE:

MR. MICHAEL I. JEFFERY, Q.C.	Chairman
MR. ELIE MARTEL	Member
MRS. ANNE KOVEN	Member

A P P E A R A N C E S

MR. V. FREIDIN, Q.C.) MS. C. BLASTORAH) MS. K. MURPHY) MS. Y. HERSCHER)	MINISTRY OF NATURAL RESOURCES
MR. B. CAMPBELL) MS. J. SEABORN)	MINISTRY OF ENVIRONMENT
MR. R. TUER, Q.C.) MR. R. COSMAN) MS. E. CRONK) MR. P.R. CASSIDY)	ONTARIO FOREST INDUSTRY ASSOCIATION and ONTARIO LUMBER MANUFACTURERS' ASSOCIATION
MR. J. WILLIAMS, Q.C. MR. B.R. ARMSTRONG MR. G.L. FIRMAN	ONTARIO FEDERATION OF ANGLERS & HUNTERS
MR. D. HUNTER	NISHNAWBE-ASKI NATION and WINDIGO TRIBAL COUNCIL
MR. J.F. CASTRILLI) MS. M. SWENARCHUK) MR. R. LINDGREN)	FORESTS FOR TOMORROW
MR. P. SANFORD) MS. L. NICHOLLS) MR. D. WOOD)	KIMBERLY-CLARK OF CANADA LIMITED and SPRUCE FALLS POWER & PAPER COMPANY
MR. D. MacDONALD	ONTARIO FEDERATION OF LABOUR
MR. R. COTTON	BOISE CASCADE OF CANADA LTD.
MR. Y. GERVAIS) MR. R. BARNES)	ONTARIO TRAPPERS ASSOCIATION
MR. R. EDWARDS) MR. B. McKERCHER)	NORTHERN ONTARIO TOURIST OUTFITTERS ASSOCIATION
MR. L. GREENSPOON) MS. B. LLOYD)	NORTHWATCH

APPEARANCES: (Cont'd)

MR. J.W. ERICKSON, Q.C.) MR. B. BABCOCK)	RED LAKE-EAR FALLS JOINT MUNICIPAL COMMITTEE
MR. D. SCOTT) MR. J.S. TAYLOR)	NORTHWESTERN ONTARIO ASSOCIATED CHAMBERS OF COMMERCE
MR. J.W. HARBELL) MR. S.M. MAKUCH)	GREAT LAKES FOREST
MR. J. EBBS	ONTARIO PROFESSIONAL FORESTERS ASSOCIATION
MR. D. KING	VENTURE TOURISM ASSOCIATION OF ONTARIO
MR. D. COLBORNE	GRAND COUNCIL TREATY #3
MR. R. REILLY	ONTARIO METIS & ABORIGINAL ASSOCIATION
MR. H. GRAHAM	CANADIAN INSTITUTE OF FORESTRY (CENTRAL ONTARIO SECTION)
MR. G.J. KINLIN	DEPARTMENT OF JUSTICE
MR. S.J. STEPINAC	MINISTRY OF NORTHERN DEVELOPMENT & MINES
MR. M. COATES	ONTARIO FORESTRY ASSOCIATION
MR. P. ODORIZZI	BEARDMORE-LAKE NIPIGON WATCHDOG SOCIETY
MR. R.L. AXFORD	CANADIAN ASSOCIATION OF SINGLE INDUSTRY TOWNS
MR. M.O. EDWARDS	FORT FRANCES CHAMBER OF COMMERCE
MR. P.D. McCUTCHEON	GEORGE NIXON

APPEARANCES: (Cont'd)

MR. C. BRUNETTA	NORTHWESTERN ONTARIO TOURISM ASSOCIATION

I N D E X O F P R O C E E D I N G S

I N D E X O F E X H I B I T S

---Upon commencing at 8:30 a.m.

THE CHAIRMAN: Thank you. Be seated, please.

You always have a way of making your presence known, Ms. Blastorah.

MS. BLASTORAH: This microphone and I don't seem to get along too well. It's just at a bad level for me.

THE CHAIRMAN: We just noted that we don't appear to have the witness statements for 11 here. We are looking at 12 and 13 at the moment.

MS. BLASTORAH: Well, I think all of the photographs that Mr. Elliott -- the only thing you would need it for would be the photographs and all of those are going to be on slides -- on the overheads.

So I think they will probably be more easily seen on the overhead in any event.

THE CHAIRMAN: All right. Reporters, if you could keep this off the record for the moment.

---Discussion off the record

THE CHAIRMAN: Very well.

MS. BLASTORAH: A few preliminary matters, Mr. Chairman. First of all, I have hard copies of the photographs that Mr. Elliott did not have included in his material. There are only two in total

that aren't actual text slides and we had reserved a number, 557, for the hard copies of those photographs. I will provide you with those.

I also have two additional exhibits I would like to mark, one is a hard copy of the text overheads and we have copies of those for the parties.

THE CHAIRMAN: You can mark that 560.

MS. BLASTORAH: These are Mr. Elliott's and these are ones that we thought relevant to file last week.

THE CHAIRMAN: Is it one page or one exhibit?

MS. BLASTORAH: It's one package.

THE CHAIRMAN: One package, Exhibit 560 then.

---EXHIBIT NO. 560: Hard copy of text of overheads in Mr. Elliott's presentation.

MS. BLASTORAH: And lastly I have prepared a photo list that gives in sequence the slides Mr. Elliott will be using -- has used in his presentation to date and will be using today.

Where the slides are photographs which are contained in the witness statement, we have so indicated with the page number in the witness statement.

Where they are text slides, we included the text just for ease of reference. So in some cases the text is also given on these overheads, but I think it will make it easier for people to follow along.

THE CHAIRMAN: And you want to have those admitted as--

MS. BLASTORAH: It's one package that is just a list, so perhaps we could mark it Exhibit 561.

THE CHAIRMAN: Very well.

---EXHIBIT NO. 561: List of text description of photographs used in Mr. Elliott's presentation.

MR. FREIDIN: Mr. Chairman, could you advise what Exhibit 559 was?

THE CHAIRMAN: I have as Exhibit 559 --

MS. BLASTORAH: I believe it's the Prescribed Burn Manual, Mr. Chairman.

THE CHAIRMAN: Copy of Prescribed Burn Manual, that's right.

MR. FREIDIN: Thank you.

MS. BLASTORAH: (handed)

THE CHAIRMAN: Excuse me.

MS. BLASTORAH: Perhaps just for the reporters, if you could indicate 560 as being the text -- hard copy of the text of Mr. Elliott's overheads, just because we will be filing copies of

overheads to be used by other people subsequently.

MR. FREIDIN: Perhaps the same for the slides, the index.

MS. BLASTORAH: And that would also apply to Exhibit 561 which is the list of photographs or list of slides rather.

THE CHAIRMAN: Very well.

MS. BLASTORAH: I think, Mr. Chairman, since we have the slide list and we provided that to the parties I won't attempt to continually interrupt Mr. Elliott by indicating which slide is up on the overhead. I think that's a bit disruptive to his presentation and I don't know that it's necessary.

I think we are at the point now where he will be indicating himself that most of the slides we will see from here on are ones contained in the witness statement and I believe he intended to indicate the photo number as it's given on the list here, in any event.

THE CHAIRMAN: Very well.

JOHN TRUMAN ALLIN,
PETER PHILLIP HYNARD,
RICHARD BRUCE GREENWOOD,
CAMERON D. CLARK,
FRANK D. KENNEDY,
WILLIAM DOUGLAS BAKER,
ROBERT ELLIOTT,
RONALD ORVAL WAITO,
DAVID M. HOGG, Resumed

MS. BLASTORAH: Could we have some someone turn out the lights, please.

CONTINUED DIRECT EXAMINATION BY MS. BLASTORAH:

Q. I believe when we left off last week, Mr. Elliott, you had just completed your description of a map which you described as a typical prescribed burn map; is that correct?

MR. ELLIOTT: A. That's correct and we are going to continue this morning with a discussion of prescribed burn operations and then move on to some general effects, and then finish up by talking about a research project that is currently being conducted around prescribed burning in Ontario.

This is photograph No. 2 in the evidence. This slide shows one of the two basic ways we ignite prescribed burns in Ontario. In this case a two-man hand ignition crew is working in igniting some slash fuel. The crewman in the yellow hard hat is using a hand-held grip torch. This torch can be best described as a container of diesel fuel with a metal outlet, long metal tube at the outlet. The diesel fuel flows from the container through the tube over a burning wick at the end of the tube and this ignites the diesel fuel which falls on the forest floor and ignites the slash fuel.

His partner in the orange hard hat is there to watch what is going on with the operation. He is in radio contact with the ignition boss, he has a portable radio on his belt, and he carries in the pack-sack the necessary equipment that the two of them need to do the job safely and properly.

Hand ignition is used on a small number of prescribed burns in Ontario now, mostly in cases where there are small areas to be burnt or where there's small pieces of larger prescribed burns that need to be touched up.

MR. MARTEL: Could I ask you, before you go on. You said photo 2, that is at page 481. Where would we find that corresponding on the --

MS. BLASTORAH: On the slide list, Mr. Martel. It's No. 14 on Exhibit 561 and he will be continuing on from there.

MR. MARTEL: All right, fine.

MS. BLASTORAH: Oh, I beg your pardon, that's Figure 2. It's No. 17.

MR. ELLIOTT: This next slide is photograph 3 of the evidence. This is the other major method we use to ignite prescribed burns in Ontario using aerial ignition.

In this case there is a flying grip torch

or heli-torch slung underneath the helicopter. Note the trail of the burning gel fuel from the grip torch falling on the forest floor igniting the fuel as the helicopter progresses according to the pattern that is laid out in the ignition plan part of the prescribed burn plan.

The gel fuel is made from a mixture of unleaded gasoline and a commercially available thickening agent known as Surefire.

Surefire is a product that is known as Calford G-760. The use of this product for this purpose was pioneered in Ontario and it is now used by most agencies in North America that are involved in prescribed burns. It is an aluminum soap originally developed for use in the petroleum industry.

The pilot in this operation is fully trained, fully qualified to conduct this type of operation. He must be present at the pre-burn briefing so he knows fully what's expected of him during the ignition operation.

The operation -- the ignition operation is controlled by the ignition boss who rides in this helicopter with the pilot directing the pilot as to where to go and the ignition boss has control over the rate of fuel flow from the heli-torch and he can turn

it off or on from a control panel inside the helicopter.

This is photograph 4 in the evidence. This slides shows the other aerial ignition device in using in Ontario. This piece of equipment drops plastic ping pong sized balls from a hopper which is mounted in the helicopter doorway. The plastic balls are filled with potassium permanganate and when they enter this part of the equipment here, they are injected with potassium -- ethylene glycol, excuse me, which is a standard antifreeze and the ball is ejected down this chute --

MS. BLASTORAH: Q. Could you indicate that again, Mr. Elliott, the chute?

MR. ELLIOTT: A. (indicating) -- outside the door between the helicopter and skid -- the helicopter skid.

The ball falls onto the ground and there is a chemical reaction that occurs between the antifreeze and the potassium permanganate which results in flaming combustion. This particular piece of equipment requires a machine operator inside the helicopter to make sure that the equipment is working properly, the machine is working properly, and there is no foul-ups, no jam-ups or anything like that in the

injection part of it and that there is a supply of ping pong sized balls in the hopper.

The operator is in touch by radio with the helicopter's pilot and the ignition boss. Aerial ignition has replaced hand ignition as a primary means of igniting most prescribed burns in Ontario.

Q. Why is that, Mr. Elliott?

A. Aerial ignition is faster, more economical and safer than hand ignition because it requires fewer people on the ground at the site.

This is photograph 5 in the evidence. This slide is the first of two which show basic ignition patterns that we use in Ontario.

In this picture the helicopter is lighting strips of fire using the grip torch. The helicopter is there in the left-hand side of the screen and he's lighting strips of fire beginning at this end of the block of ignited and working back from the right-hand side of the slide, as we look at it, to the left-hand side.

Q. Mr. Elliott, I notice the helicopter is to the left of the fire there. How does the helicopter ignition pattern keep the fire from spreading in that direction towards where the helicopter is seen there?

A. The helicopter works back into the direction of the wind so the wind is always blowing the fire away from the helicopter. That way it works in smoke-free conditions.

This is photograph 6 in the evidence And this slide shows the second major ignition pattern we use in Ontario. It's called the centre-firing or convection burning. In this slide the helicopter, which is located in the upper right-hand side of the screen --

Q. Could you just indicate that again, Mr. Elliott, I don't think the Board saw it.

A. Sorry. Just up there, he's igniting fire in a circular pattern. As ignition proceeds in this pattern, the fire that is set in the centre to start with will draw the succeeding rings of fire that are set in towards the centre as the fire increases in intensity.

The basic reason for doing this is to have the fire pulled away from the edge of the block that's being burned to reduce the chances of fire escape.

The ignition pattern is chosen during the planning process for the prescribed burn and the choice is based on the size and shape of the area to be

burned, the fire behaviour considerations that are made during the prescribed burn planning process, and the rate of ignition that's required and the ignition method that is being used.

This is photograph 7 in the evidence and it's the first in a series that show mixing of loading facilities for the heli-torch operation on a prescribed burn.

In this slide barrels of fuel have been set up so that the unleaded fuel and thickening agent can be mixed prior to the hook-up of the barrel to the heli-torch and subsequently to the helicopter. Just note that these barrels of fuel are properly grounded for primary safety requirement for this kind of operation.

Q. And that is the cables that we see in the foreground of the slide there?

A. That's right. It's cables in the foreground from the slide hooked from the barrels to the grounding rod.

This is photograph 8 of the evidence package. It shows two heli-torch crew personnel adding the thickener to a barrel of gasoline. One crewman is adding the thickener and the other crewman is mixing it with a paddle.

The specification of mix and loading area of this type of operation are spelled out in the heli-torch operations manual which specifies the size of the opening for safe helicopter operations as well as specifying the safety and training requirements for the crew involved in mixing the fuel.

This is photograph 9 in the evidence. Once the barrels of fuel have been mixed they are attached to the rest of the heli-torch.

Q. And again the heli-torch is the read barrel that we see in the lower part of the slide?

A. The heli-torch is the read barrel in the lower part of the slide and it's a silver coloured metal frame that the barrel is attached to. In this slide, there's the helicopter hovering over the torch and ready for hook-up.

The crewman takes the line that holds the torch and the control, like the electrical control line, attaches it to the bottom of helicopter while the helicopter is hovering over the top of it.

An operation like this is controlled by the helicopter pilot who is in contact either verbally or radio with another person who is standing over to the front of the helicopter, you can't see there. He signals the pilot in terms of where he should be over

that crewman so that the hook-up can be made quickly and safely.

In this particular operation there is a second helicopter. The idea here is that when one torch is empty the helicopter brings it back to the mixing and loading site, the second torch is ready to go right away, minimize the interval between ignition operations on the burn. And, of course, the other reason it's here is because in the unlikely event that one of these torches has a mechanical fault of some type, the other torch can be used to finish up the ignition operation.

All of the crew personnel involved in this kind of operation are fully trained in heli-torch operations and safe working practice around helicopters.

Moving to ignition operation. This is photograph 10 in the evidence. It's a picture taken during the ignition of the Battersby burn in Gogama Township in Gogama District in 1988.

This illustrates a fire backing down against the natural boundary. The boundary is serving to hold the fire as planned. This kind of thing would be written into the prescribed burn plan as a method of controlling this particular prescribed burn. The

natural boundary can be described as an area along the perimeter of the fire because of the fuel type, fuel condition it will serve to hold the fire from spreading.

Examples of natural boundaries are swamps, black spruce stands in late summer, pure hardwood stands after leafout --

Q. Mr. Elliott, if you could just go back to that one for a moment. I notice the smoke pattern is going off to the left of the photograph. What is the significance of that?

A. The smoke is going this way, it shows going off to the left of the photograph. All that shows is the wind is blowing -- in this particular part of the fire, the wind is blowing from the bottom right-hand corner across to the top left-hand corner which means that it's a backing fire which is spreading slowly back against the wind.

Q. On that last point, that would have been intentional or not to have the fire backing into the wind that way?

A. It's intentional, it's part of the ignition plan to have the fire backing into the wind and the boundaries like that reduces the chance of fire escape.

This slide is photograph 11 in the evidence. It's again from the Battersby burn and it shows the effectiveness of the natural boundary stopping the spread of the fire. The ignition operation is over at this point.

Q. Could you just indicate where that natural boundary is?

A. The natural boundary is along the edge of the burned area running from the top left-hand corner of the slide across to about the middle of the right-hand side.

This is photograph 12 in the evidence. This slide shows a sprinkler system which has been set up on a prescribed burn in the Dryden District prior to ignition. The sprinklers are located approximately 100 feet apart and these are the sprinklers that if you are a golfer you can see on a golf course on any day that they are watering the fairways and the greens.

They are located about a hundred feet apart. They operate long enough prior to ignition to wet down the fuel in this area so that when the fire approaches after it's been ignited, the fuel in this area is too moist to support combustion and the fire will slow down or stop completely along the sprinkler line.

Sprinklers are only one way of constructing prescribed burn boundaries. The other methods of constructing controlled boundaries are the use of a bulldozer to construct a line of bare mineral soil around the perimeter of the burn, and another way is to use fire suppression crews with pumps and hoses to extinguish the burning edge as the ignition progresses along near the prescribed burn perimeter.

This is photograph 13 in the evidence. This slide shows the effectiveness of a sprinkler system in stopping the spread of a fire and you can see the scalloped edge that runs from, near the bottom right-hand side of the slide across the edge of the burned area between the burned area and the standing trees.

It's important to recognize that a sprinkler system will not stop the fire in all cases. The use of sprinklers though, built in as part of the planning process, well thought out at the planning stage are only used in appropriate spots along the prescribed burn edge.

The prescribed burn manual requires that every prescribed burn have a post-burn report completed and I will talk about three things. I'm going to talk about the report, I'm going to talk about reviews and

I'm going to talk about audit.

There is an example of a completed post-burn report found on page 536 of the written evidence. The purpose of the post-burn report is to document actual results and compare them with the planned results and report observations of how the operation went.

MS. BLASTORAH: I don't think it's necessary to turn to that, Mr. Chairman. The page -- page reference was just for your reference.

MR. ELLIOTT: The fire boss, the unit forester, the district manager, the regional prescribed burn specialist and the provincial prescribed burn operations officer are interested in the contents of these post-burn reports and they read them. These are the people in the organization that have prescribed burning as part of their job requirement. We want to ensure that the program is properly managed and properly carried out.

The contents of the post-burn report include, of course, the prescribed burn name, number, location, date of the burn, fire boss name, and description, desired results. It includes information on the fuel loading on the site prior to the burn and after the burn, it describes the ignition method and

pattern.

*** The prescribed post-burn report documents the weather information which is collected hourly during the burn as well as the noon weather information that it normally collects along with mini-sonde upper air information. The upper air information is wind, speed, and direction of various altitudes. This is required to help predict fire behaviour and monitor smoke dispersion. Fire behaviour observations are documented in the post-burn report as well.

The cost of the operation by phase is reported on. There is a safety officer report including a description of any problems -- safety-related problems and a log of any accidents or injuries that occur on the burning operation.

Any deviations from the approved plan with an explanation are reported in that post-burn report and major deviations would not be expected in any prescribed burn. Once the plan is laid out and approved, the operation is to go according to what's in the plan. Minor deviations such as an increase in the rate of ignition because of a local condition at the time of the burn or something like that could happen and would be documented in the post-burn report.

THE CHAIRMAN: Mr. Elliott, have you had

any fires that have really gotten out of control since you put the new procedures into effect?

MR. ELLIOTT: There has been some escape since we have put the new procedures into effect and I will be talking about that a little later on in my presentation.

THE CHAIRMAN: Okay.

MR. ELLIOTT: Not very many. The detrimental effects such as siltation erosion or damage to areas of concern are documented if there are any. Comments from all parties concerned such as forest management staff, district managers, and the fire management organization along with the review of the public communication plan are included in the post-burn report.

Any treatment of the site prior to the burn such as preparing or some other treatment is recorded. In the event that there is a fire escape or some other unforeseen event that happens on a prescribed burn operation a Board of review can be established to examine the operations that took place on the fire to try and determine the cause of the escape or the unforeseen events and make recommendations so that those kinds of things won't happen again.

And finally --

MS. BLASTORAH: Q. Just before you go on -- sorry Mr. Elliott, you indicated that a board of review can be struck. Would that be the normal practice?

MS. ELLIOTT: A. That decision would be made by the Regional Director based on his understanding of the events that happened on that particular fire.

Q. For significant deviations or problems arising from a burn, would that be normal?

A. For significant unexpected occurrences such as fire escape, that would be normal.

In addition, the prescribed burn program can be audited in the field like any other Ministry program to make sure that it's being done efficiently and effectively.

I will move on to a discussion of some of the general effects, since I stated at the outset we are going to be talking about general effects excluding fish and wildlife life type of effects.

The effects of prescribed burning can be categorized as immediate or long term. They can be further categorized as positive or negative. Examples of the immediate effect include production of smoke and

the removal from fuel -- removal of fuel from the site as a result of the fire. The example of the long-term effect would be the amount and type of new vegetation on the site some time after the burn.

The achievement of desired results in terms of fuel removal, preparation of the site for regeneration, and the establishment of a successful new forest are viewed as positive effects of prescribed burn.

Potential negative effects such as erosion, sand and seed degradation are usually the result of other than intentional fire and have been prevented with proper prescriptions, the development of sound operating plans and by ensuring that the plan and conditions contained therein are followed and conducted to a prescribed burn.

In other words, prescribed burn effects can be described as risk. There is an element of risk in all prescribed burn operations. There is a risk of fire escape, there is the risk of potential negative effects and there is the risk that the fire will not achieve the desired results.

During the application, that is, of the prescribed burn proposal stage and during the planning phase of the prescribed burn operation, the risk is

calculated and described and explained by fire management personnel. The level of acceptable risk is decided by the unit forester for timber management and ultimately by the local district manager for all values in the area of the prescribed -- planned prescribe burn. In cases where the risk is too high, some other site preparation method will be chosen instead of prescribed burn.

Q. Mr. Elliott, in terms of risk, what sorts of risks would we be talking about there?

A. We are talking about the risk of fire escape, we are talking about the risk of damage to some either timber or non-timber value in the area in and around the prescribed burn.

Q. In your experience where there was a non-timber value, for instance, a fish or wildlife value, would the fish and wildlife personnel in a district formally be involved in that risk evaluation?

A. Yes. They would be involved at the prescribed burn proposal stage. The proposal would be shown to them and they would have an opportunity to take a look at what was planned as far as the area being treated was concerned, and they would be asked for their assessment of the values related to their program in the area and they would have a say in the

risk business.

Q. Thank you. One other question on that. You indicated that where potential negative effects occur they are usually the result of the types of factors you were talking about, by saying -- I think the particular negative effects you referred to was erosion. By saying that, did you mean to indicate those sorts of negative effects are usual?

A. No, they are not usual and the exception normally in Ontario. We don't see erosion as a major problem as a result of the prescribed burning.

Q. Thank you.

A. This slide categorizes a risk associated with a prescribed burn. It talks about the risk of escaped fire.

Our records indicate that in the last 23 years 38 of out 642 fires have escaped -- prescribed burns have escaped. There is a chart of that on page 472 of the evidence.

Mr. Chairman, you asked me about the numbers in recent times. There is a table in the written evidence, on page 472, that traces escape fires back to 1966, recent experience since 1980, I guess in terms of better or worse.

In 1987 there was 59 prescribed burns

conducted in the Province of Ontario; five were counted as escapes and they got outside the prescribed burn boundary.

Q. And I believe that table on page 472 also indicates the area burned which is quite variable?

A. That's right. That depends of course on the fuel and the fire behaviour in the area surrounding the prescribed burn, if it does escape.

Q. I take it from that, that the area actually burned does not have any -- does not determine whether a fire is categorized as an escape fire?

A. That's right. Fire is categorized as an escape fire when it exceeds the allowable burn boundary that is described in the prescribed burn plan.

Q. So it could be a relatively small area outside the prescribed boundary that is burned?

A. It could be anything from a couple of hectares to several hundred hectares.

Q. Thank you.

A. In any event, if there is an escape it's treated as wild fire and the suppression response is immediate and the objective is to place the escape fire under control as quickly as possible.

The other type of risk that we talked about is the risk to areas of concern and to other

values, either timber or non-timber and to a fire person areas of concern are just another value out there in the forest and would be assessed along with timber and non-timber values and dealt with accordingly in the planning and conducting of prescribed burn operations.

In all cases, the risk is considered during the plan preparation and decisions are made about what will be done to protect these areas of concern. The decisions can result in a variation in ignition pattern; that is, designing an ignition pattern to keep the fire away from the area of concern, or it could be the use of some fire control operation, some suppression technique to protect the particular value in that area of concern.

The other type of risk is associated with the expected results of the burn and we will come back to that. In the rare and exceptional case where there have been some fire escape or some other problem such as damage to a value or area of concern, it's usually because of poor planning. By that I mean, setting the wrong prescription, choosing the wrong ignition pattern, or not doing a good job of suppression planning because people on site for some reason or another, didn't comply with the plan, or in some cases

there are unforeseen or unpredicted weather anomalies such as change in the wind, increase or decrease in speed or direction.

Q. And those are sorts of things that would be picked up in the post-burn review; is that correct, that you described earlier?

A. That's correct. Those would be documented in the post-burn report and if they were serious enough, if there was an actual fire escape, it was serious enough damage, then it would be the subject of a board of review.

As important as the other side of the equation, that is that from time to time fire does not achieve the desired results because it is not intense enough and, hence, does not remove enough organic fuel material.

Smoke is another of the immediate effects of prescribed burns and this slide is just intended to show the comparison of smoke production from prescribed burn and smoke production from wild fires from 1966 to 1988.

The amount of smoke from prescribed burns is small by comparison than the amount of smoke from wild fire. In any given queer the amount of smoke produced by prescribed burns is small in comparison to

that produced by wild fire.

This is photograph 27 in the evidence. It's the smoke column from the Battersby Township prescribed burn in the Gogama District conducted in the summer of 1988. The primary objective of smoke management on prescribed burns are to ensure that populated areas or well-travelled routes are not adversely affected by the smoke from prescribed burns.

That strong convention column is built by the fire -- strong convection column built by the fire to keep the working area -- working site around the fire relatively smoke free.

Please note the effect of the wind on the air below the column being bent to the right-hand side of the slide.

This is photograph 27 in the evidence -- sorry this is photograph 28 in the evidence. This slide was taken on the Sunshine Lake prescribed burn in Geraldton District in 1985 and it shows the early development of a convection column soon after ignition.

This is photograph 29 in the evidence and it shows the smoke conditions after most of the ignition has been complete. These are the kinds of conditions that one could expect somewhere between four and six hours after ignition on most prescribed burns.

What's left is smouldering fuels and a little bit of smoke.

This is photograph 30 in the evidence and it is again taken in the Sunshine Lake prescribed burn in Geraldton District in 1985 and it shows the smoke conditions well after ignition. This slide was taken during the evening of the day of the burn.

There one other thing I would like to point out about this slide. When we were talking earlier about natural boundaries, in the case of the Battersby burn the natural boundary was a green area along the creek. In this case the natural boundary is standing timber and it is in fact the shoreline reserve that was left around this particular lake and it served to stop the spread of the fire. That is also an effective natural boundary. Can be seen down the centre of the slide adjacent to the shore of the lake.

Q. Mr. Elliott, you indicated earlier that black -- I believe you said black spruce stands in mid-summer and deciduous stands after leafout could serve as natural boundaries; am I correct?

A. That's correct.

Q. Why would that be?

A. They serve as natural boundaries because of their fuel condition. The moisture content

of the fuel in stands like this, black spruce stands and deciduous hardwood stands, are such that the combustion won't be supported and the fire will go out when it approaches -- enters those stands at that time of year.

Q. And again you indicated this slide, I believe photograph 29, is the same day as the day of ignition?

A. This is photograph 30.

Q. I beg your pardon, 30.

A. Yes. These are the conditions late in the day of ignition. This slide was taken in the evening.

This is photograph 31 in the evidence and it's a classic example of using centre fire to build a strong convection column. This particular column is measured at 11,500 feet at the top.

Q. Just out of curiosity, Mr. Elliott, that sort of slice of - I can't tell whether it's smoke or cloud cutting across the middle of that convection column. Is that smoke or cloud?

A. Here (indicating)?

Q. Yes.

A. That's probably a mixture of both. This is a formation of a cloud on top of the smoke

column. This around here (indicating) would be a combination of water droplets and smoke.

I will talk about some effects of prescribed burning on the forest and look at some assorted number of slides that have been taken some time after the prescribed burn treatment has been applied.

This is photograph 14 in the evidence. It's an area in Dunmore Township in Kirkland Lake District and was harvested in 1968 and in '69. Both jack pine and poplar were taken from the site. 202 hectare area was burned in 1969 by prescribed burn and planted with bareroot jack pine in 1970. This slide is taken in August, 1986, 16 years after the area was treated.

Q. Could you just put that up again, Mr. Elliott. I don't think the Board had a chance to see it.

A. Sorry.

Q. Thank you.

A. This is photograph 15 in the evidence and it's another shot of the regeneration in the Dunmore Township prescribed burn. You will note that there is both poplar and jack pine back in that stand.

These next three slides are photographs

16, 17 and 18 in the evidence and they are again in the Kirkland Lake District in Corkhill Township. This was a balsam fir working group that was cut-over between 1974 and 1976.

The area was tramped using bulldozers an and shark finned barrels in mid-summer and early fall of '76. 336 hectares were prescribed burn in July, 1978. The area was planted to jack pine using both bareroot and container stock in the spring of 1979. These slides show the jack pine regeneration 7 years after planting.

Q. And that's in the foreground of the photograph?

A. That's right, this is photograph No. 17. This is photograph No. 18 again showing the regeneration on the site after the burn that was planned.

This is photograph 19 in the evidence. It's an area of Kenogami Township in the Timmins District that was cut-over in 84-85. The 520 hectare area was prescribed burn in August, 1985. In this particular case, note the patchy burn results. There is lots of unburned green areas inside the prescribed burn area. This is the result of the amount of herbaceous vegetation that was present on the ground at

the time of the burn. The area was planted with back pine bareroot container stock and black spruce bareroot container stock in 1986.

Q. Mr. Elliott, on that last photograph you indicated that there was quite a bit of patchiness in the burn result. Would that be an acceptable result notwithstanding the patchiness of the burn?

A. Yes, that would be an acceptable result. In that case there was enough plantable spots generated by the prescribed burn, so that it was a successful operation.

Q. Would that sort of thing show up in the post-burn report in the normal course?

A. Yes.

Q. Thank you.

A. This is photograph 20 in the evidence. It's the same prescribed burn as the previous slide in Kenogami Township. In this particular area of the burn, the fire was alittle more intense and did expose some mineral soil. Note the jack pine seedling down here by the boom and down in the bottom centre of the picture.

Q. Would mineral soil exposure of this type that we see in the slide here be a problem?

A. No. In this case and in most cases

mineral soil exposure is minimum. This would have happened in a case where the organic layer was fairly thin and, in this particular case on this burn, there was an average depth of burn of 1.7 centimetres leaving an average depth of organic material on the site of 5.5 centimetres.

Q. When you indicated that this particular instance of mineral soil exposure would have resulted from a thin layer of organic material, would that be just in a limited area or over the whole burn?

A. No, this would have been in a limited area.

This is photograph 21 in the evidence and it's again another view of the Kenogami Township prescribed burn showing the variability in burn results. Note there's a fair amount of boulders and rocks throughout the site. This is an example of one area that a forester may choose to burn because of the rocky site.

These photographs, the last three, were taken in August, 1986 just a few months after the area had been planted.

Q. You indicated this would be a situation where the forester might decide to burn because of the amount of rock. What effect would the

amount of rock have on that decision?

A. It makes the movement of mechanical equipment difficult over the site.

This is photograph 22 in the evidence. It's a 181 hectare area in Ecclestone Township in the Kapuskasing District that was harvested in 82-83. There was prescribed burn in the summer of '83 and planted with white spruce in the spring of '84. These are the results two years after planting. This is a black spruce seedling.

Next is a sequence of slides that were taken on the Sunshine Lake prescribed burn in the Geraldton District in 1985. The idea here is to show fuel before and after prescribed burning and what the site looks like one year later.

This is photograph 24 in the evidence which is a 625 hectare prescribed burn at Sunshine Lake. The steel post in the bottom of the slide and the number indicate a fuel plot that is established on the prescribed burn to measure the amount of fuel on the ground prior to the burn.

The main forest types in this area are balsam fir, black spruce and white birch working groups and the area was logged over between '83 and '85. Post-logging forest cover was characterised as heavy

thickets, small diameter balsam fir with residual white birch and small diameter spruce left in the lowland areas.

Q. Is that the type of thing we see in the background of the photograph, the residuals that you just mentioned?

A. Yes. White birch and other residuals left in the back of the photograph.

This is the same location on the burn after the burn had been conducted. Fuel plots like this are established on all prescribed burns. They are established in areas representative of the fuel across the burn. The number of plots would be determined by the fuel complex on the burn itself.

MR. MARTEL: Is it usual to have that much of the larger material left unburnt?

MR. ELLIOTT: Yes, it is.

MR. MARTEL: It would decay pretty quickly afterwards; wouldn't it?

MR. ELLIOTT: It stays quite awhile. What it does is make the area a lot easier for access to plant the trees or to conduct any follow-up site preparation that might be required.

Note the string lines that run from the bottom left-hand side of the slide up the left-hand

side and another one that runs from the bottom left-hand side of the slide across to the right-hand side.

Crews when they are measuring the fuel both before and after the fire follow these string lines and measure every piece of fuel that is intersected by that string. From that a fuel weight can be calculated as well as an inventory of the size, class, distribution of the fuels in that particular plot. The results from the post-burn measurement are documented and reported in the post-burn report.

MS. BLASTORAH: Q. When you say they measure every piece of fuel, would that be all of the unburned slash that we see still on the site?

MR. ELLIOTT: A. That's right. In addition the organic material -- there is a sampling of the organic fuel layer done along the plots as well to measure the depth of the organic material prior to and after the burn.

this is photograph 26 in the evidence and it's at the same location fuel plot No. 1 one year after the burn. There are spruce trees in there that were planted after in the spring of 1986.

Q. I see a couple of trees just on the far left of the photograph and in the bottom right that

are sort of blackened looking. Are those ones that would have been charred a bit in the burn?

A. Yes, these trees would have been burned. During the prescribed burn operation fire would have charred the trunk of the trees both there and there. (indicating) There's another tree on the right-hand side of the slide as well.

The other thing I would want to point out, besides the fact that there were spruce trees planted in this area in the spring of 1986, a fair amount of herbaceous and grass type vegetation has grown back on the site as well one year later.

I talked a little bit about the research project that is currently underway in Ontario. This is a cooperative research project involving Forestry Canada, The United States Forest Service, the American National Aeronautic and Space Administration, the American National Oceanic and Atmospheric Administration, Canadian Atmospheric Environment Service, the Ontario Ministry of the Environment, and the Ontario Ministry of Natural Resources.

MS. BLASTORAH: Those agencies are all listed in the handout of overheads, Mr. Chairman.

MR. ELLIOTT: The objective of the project is to develop a model for large scale

convection burns through an understanding of fire behaviour which is influenced by weather, atmospheric conditions and ignition patterns and quantify the amount and distribution, physical attributes, chemistry, the dispersal of smoke and trace gas emissions from convection burns in order to model their impact on air quality and atmospheric chemistry. This project commenced in 1988 and is expected to continue for a number of years.

In summary, Mr. Chairman, I talked about prescribed burning as a tool that we use in forestry to prepare the site for planning and this slide has just been tendered as an illustration of my presentation.

MS. BLASTORAH: Q. I take it these are not all the same site?

MR. ELLIOTT: A. These are not the same site, no. These are representative of standing forest cut-over areas being prescribed burn and regeneration results in a fully pictorial form.

MR. MARTEL: What is the biggest burn that you have done?

MR. ELLIOTT: The biggest burn would be in the order of about a thousand hectares.

That, Mr. Chairman, is my evidence.

THE CHAIRMAN: Thank you.

MS. BLASTORAH: Mr. Chairman, Mr. Baker is going to be giving his evidence next and I anticipate it will probably take about an hour and a half to two hours. Would you like to just start into that, or take a short break now?

THE CHAIRMAN: All right. Why don't we take the mid-morning break and come back and start with his evidence.

MS. BLASTORAH: Okay. That will give us a chance to set up.

Thank you.

---Recess taken at 9:40 a.m.

---On resuming at 10:10 a.m.

THE CHAIRMAN: Thank you. Be seated, please.

(noise disturbance)

MR. HYNARD: Like the Chairman said, you make your presence known.

MS. BLASTORAH: Just annoucing my presence.

THE CHAIRMAN: We know you're there.

MS. BLASTORAH: Sorry, about that, Mr. Chairman. I hope I didn't deafen anyone.

Just before we begin with Mr. Baker, I neglected to file one small exhibit relating to Mr.

Elliott's evidence. It is a pamphlet that's produced by the Ministry of Natural Resources intended for public distribution and it is entitled: Prescribed Burning in Ontario, the Use of Fire to Renew our Forests.

It is a small fold-out pamphlet that is handed out, I understand, to the general public and particularly school children and so on, and I believe has recently been distributed in conjunction with National Forestry Week which is I believe this week.

If I could just file a copy of that for information purposes.

THE CHAIRMAN: Very well. Exhibit 562.

---EXHIBIT NO. 562: Pamphlet produced by the Ministry of Natural Resources entitled: Prescribed Burning in Ontario, the Use of Fire to Renew our Forests.

THE CHAIRMAN: If it is for school children we should be able to understand it.

MS. BLASTORAH: It has very nice pictures.

MR. FREIDIN: I understand during National Forestry Week all hearings are cancelled.

MS. BLASTORAH: Too late.

I just point out, Mr. Chairman, you may recognize one of the photographs which was -- the one on the far right-hand side of the brochure, as it is

folded out, is one of the slides that was used by Mr. Elliott in his presentation after the burn, just as a matter of interest.

The next exhibit I would like to file, Mr. Chairman, does relate to Mr. Baker's evidence and it is a copy of his reference No. 1 entitled: The Tree Improvement Master Plan for Ontario.

THE CHAIRMAN: Exhibit 563.

MS. BLASTORAH: This document was served on all the parties and copies were provided to the Board in conjunction with the witness statement. So I have one copy here for the official exhibit.

THE CHAIRMAN: Okay.

---EXHIBIT NO. 563: Document entitled: The Tree Improvement Master Plan for Ontario.

MS. BLASTORAH: Q. Mr. Baker, what are the main messages you wish to convey to the Board through your evidence?

MR. BAKER: A. I have five main messages that I would like to start off with this morning.

My first message is that the Ministry of Natural Resources has embarked upon the tree improvement program with the goal of producing larger trees in a shorter period of time; in other words, faster growing trees and, at the same time, producing

better quality trees that are more suitable for the final end product.

This will be achieved by improving the genetic potential of the stock used in artificial regeneration. A provincial strategy entitled: The Tree Improvement Master Plan for Ontario, which was just filed Exhibit 563, has been developed and published in 1987 to guide and direct our program.

My second message is that Ontario's tree improvement program has been sub-divided into two levels. The basic program and the extensive program, and these levels are based upon the intensity of effort, the immediacy of results and expectation for genetic improvement.

My next message is that tree improvement is a vital step if we want to maintain a competitive forest industry in a global marketplace. To accomplish this, Ontario's tree improvement program is emphasizing quality and quantity of wood fiber produced.

My fourth message is that Ontario's tree improvement program captalizes on genetic variability, but at the same time we maintain genetic variability.

And my fifth and final message is that a major objective of our tree improvement program is to develop widely adapted populations of trees that will

perform well on a variety of sites. This will provide additional flexibility in the artificial regeneration program in the future.

Q. Mr. Waito indicated in his evidence that you will be describing how and where seed is obtained for the artificial regeneration program; is that correct?

A. Yes, that's correct. I will be talking about cone collection and seed extraction and, as Mr. Waito has indicated, we use seed for our seeding program and for the production of bareroot and container stock. About 65 per cent of all the seed that we use is for the seeding program.

Of all the seeds shipped, jack pine accounts for the largest percentage, I would say probably in the neighborhood of 70 per cent, and this is because of its direct seeding requirements.

In addition, a number of other species are used for seeding but they are on a much smaller scale. In total, 42 tree and shrub species are collected in our seed collection program.

Q. Is seed from these species collected in the area of the undertaking -- from all of these species rather, from the 42 you just mentioned?

A. No. The 42 represents the provincial

program, and I would say probably half of that number would be collected in the area of the undertaking. The 42 species represents such things as carolinian species which are collected in a small amount in the area outside of the undertaking. It would also include shrub species that are used for erosion control and for wildlife purposes, such things as red orchard dogwood and highbush cranberry.

Q. Are cones and seeds collected every year?

A. Not usually in conifers, but this is species-dependent. As Mr. Hynard indicated last week, cone crop production is irregular in forest trees. For example, in white spruce you may only get a good cone crop every two to eight years. When cone crops are poor, there is a low number of cones per tree and seed yield and quality are low because of incomplete pollination and there seems to be a tendency to have a higher percentage of cones with some type of cone or insect problem -- cone/seed insect problems.

As a general rule, cone collections are only undertaken in good or heavy cone crop years. What this means is that we must collect enough seed during these heavy seed years to compensate for poor seed years, and this is possible because seeds of most of

our conifers can be stored below freezing temperatures for long periods of time.

Now, to determine the amount of cones and seeds we must collect, we have to have an indication of how much seed we have in our seedbank. We also have to know the five-year forecast for the production of bareroot and container stock, as well as for seeding requirements and, in addition, we must have some indication of the potential of a good cone crop developing.

To determine the potential development of a good cone crop we undertake what is called cone crop forecasting. To assist our staff in doing cone crop forecasting, the Ministry of Natural Resources has prepared a publication entitled: Guidelines for Tree Seed Crop Forecasting and Collecting.

MS. BLASTORAH: Mr. Chairman, I have copies of that document. It is a small booklet, as you see here. It is intended, I believe, to be used in the field, I take from the size, Mr. Baker?

MR. BAKER: That's correct.

MS. BLASTORAH: It is -- as you can see, would fit the vest pocket and so on. I would like to file that at this time, and we do have copies for the parties since this was not previously provided.

THE CHAIRMAN: Exhibit 564.

---EXHIBIT NO. 564: Publication entitled: Guidelines for Tree Seed Crop Forecasting and Collecting.

MR. BAKER: If you flip through this publication you will notice that it covers most of the 42 species that I have mentioned. It provides information on crop intervals by species, their flowering habit, information about forecasting like when to forecast and what to look for.

In addition, there is information on collecting, the time to collect the various species, collection methods and storage and shipping procedures.

MS. BLASTORAH: Q. I see this publication contains coloured photographs. What's the purpose of that?

MR. BAKER: A. Primarily for any individuals collecting so they will have a good idea of when seeds are mature. Most of the seeds of Ontario's conifer mature in the late summer or early fall.

As had been mentioned previously, jack pine has serotinous cones and black spruce has semi-serotinous cones. What this means is it will allow us to collect cones throughout the year once a seed is mature.

So, in other words, with jack pine we can

collect cones that have been on the trees for up to six or seven years.

Q. How do you go about collecting the seed required?

A. Well, there is four main methods that are used in Ontario. The first one is collecting in the slash following harvesting and that's the most common method that we use. To do that you have to time your harvesting activity when the cones and seeds are mature.

So, in other words, your harvesting has to occur later on in the summer or early in the fall. Most of the collection by this means is by manual means, people going out and picking through the slash.

With black spruce, on occasion we do have tops that have a large number of cones on them being collected, brought to a central location where the tops will be processed through a cone thrasher that will mechanically separate the cones from the rest of the tree top.

The second main method is climbing and that is used to obviously collect cones from standing trees when we cannot time the harvest with the cone crop, or if there is a bumper crop, obviously you can't go out and cut enough area to meet your targets.

The third method of collecting cones is through an aerial rake and this is a device that has been used on occasion in Ontario, and what it is is a device that is suspended beneath a helicopter, you fly over trees that have a heavy cone crop, the device then snips the top and takes off the branches and drops them into the bucket on the device, and then they are sent to a central location where the cones are collected, either manually or mechanically.

Q. Would that be a process that's commonly used?

A. No, it's fairly infrequent, but if they are a good cone crop and we have no other means of collecting, it has been used, in northwestern Ontario anyways.

Q. Why would it only be used infrequently?

A. primarily because of the cost. You are talking about helicopter time which is expensive.

I mentioned that there was forth methods, and the final method is using **squirrel caches and we only this when other methods are impractical but we do use it for red pine or white mine.

Q. Why for these species in particular?

A. They are very difficult to collect

from -- especially from standing trees.

Q. Who actually collects the cones?

A. Most of the cones that are collected for the Ministry of Natural Resources come from private individuals or contractors, and these have developed into a small cottage industry. There is a small percentage that the Ministry of Natural Resources collects and that would be through climbing or using the aerial rake that I just described.

The contractors are paid by the volume and it is the -- the volume measurement we use is a hectoliter. A hectoliter is 2.7 bushels, and if you have problems translating that, if you can think of a standard green garbage bag and you filled it with cones, that would be about a hectoliter of cones, but I wouldn't advise using a green garbage bag. We do provide burlap collection bags to the collectors.

The prices we pay vary by species which is partially indicative of the difficulty in collecting them and cone size. For example, jack pine, currently we pay $70 per hectoliter; black spruce is in the neighbourhood of $120 per hectoliter; and species like tamrack or hemlock, which Mr. Hynard had talked about, we can pay between 200- or $400 a hectoliter.

Q. Why would that be so much more?

A. They are very difficult to collect because of the small nature of the cones and if you have to climb the trees it's difficult.

Q. Does the Ministry of Natural Resources maintain control over where cones or seeds are collected?

A. Yes. We employ seed source control through the use of seed zones.

Q. Would you explain what you mean by seed source controls and seed zones?

A. A prerequisite to any seed collection and tree improvement program is to control the source of seed. Local seed is usually best and safest and this has been demonstrated through a number of research outplantings. And the reason I say this is that because population of trees from which the local seeds were collected have survived local conditions of temperature, photo period, and in some cases site, through many generations of natural selection.

To control the source of seed and ensure local seed is used, the province has been divided into seed zones. These seed zones are areas delimitated by geographic bounds, climate, and growing conditions within which any seeds may be moved freely without any undue risk. And at this time I have an overhead that I

would like to put up showing the various seed zones.

Q. Just before you do that, Mr. Baker, you used two terms that I think are new to the Board and perhaps you could just give a brief definition. The first one was outplanting?

A. By that I mean establishing tests through the use of seedlings by planting them in the ground.

Q. And the second term was photo period?

A. Photo period refers to daylight.

Q. Thank you. I believe the overhead you are going to use is contained at page 567 of the witness statement -- or the statement of evidence?

A. That's correct.

MS. BLASTORAH: And that's the seed zone map, Mr. Chairman.

Again, we have it on the overhead so I don't think it will be necessary to refer to it and we also have an amendment to that. The legend was left off the map that was contained in the statement of evidence, so we have revised copies of Figure 1 from 567.

THE CHAIRMAN: So we probably should give it a separate number?

MS. BLASTORAH: I think probably that

would be a good idea.

THE CHAIRMAN: Exhibit 565.

---EXHIBIT NO. 565: Revised copy of Figure 1, page 567 of Panel 11's witness statement.

MR. BAKER: Can you see that or should somebody get the lights?

MS. BLASTORAH: I think perhaps we should have the lights out.

MR. BAKER: In Ontario the seed zones are based upon two things; one is the site regions, and the other is administrative district boundaries.

Site regions have been previously described by Mr. Beechey in Panel 7 and these are the same site regions that he had referred to and talked to the Board about.

To ensure that only local seed is used, these site regions have been further sub-divided using MNR's district boundaries. This has been done for administrative convenience, but this is a conservative approach that will achieve the biological and genetic objective of using only local seed.

MS. BLASTORAH: Q. Mr. Baker, when you say it is a conservative approach, could you expand on that a bit?

MR. BAKER: A. Well, the conservative

approach I am referring to is using local seed based upon those outplanting trials that I have referred to because they have been adapted to the local conditions.

When any seed is collected in the province through the seed zones, we assign what is called a seed source number to it and this seed source number stays with the cones and seeds through the collection process, through seed extraction, then into storage, and also when the plantations have been established through planting or seeding.

The seed source numbering system that we use is outlined on page 120 to 125 of the crop forecasting guideline that we just handed out.

Q. That's Exhibit 564.

A. Exhibit 564. And if you look through there, on page 120 you will see that the seed source number is made up of five numeric fields which identifies the species, the site region, the administrative district, the collection agency - and by collection agency I mean, was the collection done for the Ministry of Natural Resources or did an FMA holder or some other individual undertake to do the collection - and then the final category is called collection type, which I will explain later on this morning.

So, for example, if we were to receive a general jack pine cone collection from Kenora District in, let's say site region 4300, it would have a special seed source number and, in this case it was jack pine, so the species number is 003. The site region was site region 4300 which is this area up in here. (indicating)

Q. That's the red area in the upper left-hand corner of the map which is on the overhead?

A. That is correct. And then it would be 14, which is Kenora District number, followed by 10 because it was a collection for MNR, and then followed by the last field of 00 because it was a general collection.

Q. I believe the cones that you have just been referring to are contained in Exhibit 564; is that correct?

A. That's right. Page 120 to 125.

Q. Thank you. Is it always the case that local seed is best, Mr. Baker?

A. Yes, it is. Well, let me rephrase that. But I want to shut this off first because I am finished with it.

Q. Sorry.

A. Can I have the lights, please?

Q. Mr. Baker, I just asked you: Is it always the case that local seed is best?

A. Usually, but not necessarily. But in the absence of proof through what we call provinence testing, we take the conservative approach and only use local seed.

By provinence testing or seed source test, what I am referring to are replicated experiments which compare tree growth from collections in many parts of a species range and, in some cases, we find that some non-local sources may do better than a local source but we need proof through these provinence testing.

To give you an example, the Canadian Forestry Service in Petawawa has undertaken a number of provinence tests for many of our conifer species. In a recent study with black spruce, they have found that a source from the North Bay area has performed well throughout many locations in Ontario, including the Thunder Bay area as well as the Dryden area.

Q. What happens to the cones once they are collected?

A. Well, first of all, we keep them separate by seed zone, by the seed source number I have just talked about.

Then they are sent to the two extraction plants that we have. There is a facility in Dryden, Ontario which looks after extracting only jack pine cones for northwestern region and that is due to the large jack pine seeding program in the northwest. All other species from all of the other MNR regions are sent to the facility at Angus, Ontario which is near Barrie.

Here the cones are extracted by applying heat which will allow the cone scales to flex open and, at the same time, these cones are tumbled so that the seed falls out and it normally falls out, at least at Angus, to the floor below so they are not subjected to the fairly high temperatures they use to open the cones up. I believe they use temperatures in the neighborhood of 50 to 60 degrees Celsius for a 16-hour period.

Once we have the seed, we have to take the seedwing off and remove any of the debris, and this is done through a series of airblasts and screens. This seed is then subjected to germination tests, then prior to storage we will reduce the moisture content of seed down to 6 to 8 per cent which will increase the longevity of the seed in storage. Then it is put into cold storage at -3 degrees Celsius until it is

required. Periodically during that time we do germination tests to see if there is any loss in vigor of those seed lots.

And, finally, there is a computerized database recording all seed lots by seed source number to allow us to know how much seed we have on hand. So we can then go back and determine how much seed we may require for the following year.

Now, I do have a number of samples of cones and seeds here that I could show the Board if you are interested. I have them along because there is a major difference between cones and seeds of white pine compared to the black spruce.

MS. BLASTORAH: Mr. Chairman, would you like to take a look at those briefly now, or we could make them available at the end of day, whichever you would prefer.

THE CHAIRMAN: Probably I think we can go on with the evidence and have them available at the end of the day.

I take it you are not planning to exhibit them in any way?

MR. BAKER: No.

MS. BLASTORAH: No, they were merely for demonstrative purposes. We can put them on one of the

tables at the back perhaps with some kind of labelling to indicate the species just so that people can get a sense of what it is Mr. Baker is describing.

THE CHAIRMAN: Very well.

MS. BLASTORAH: Q. How long can seed be stored?

MR. BAKER: A. Natural variation varies greatly with the different species; however, under regulated storage conditions provided by man, longevity of many of our species can be extended more than ten-fold over conditions found in the forest.

For example, pine and spruce seed that is naturally dispersed in a forest stand may survive until the following growing season. However, those same species, if we store them under controlled conditions, we can maintain the viability for 10, 15, 20 years and more. That applies more so to conifers.

Hardwoods are a slightly different story and the storage of hardwood varies greatly with species. Some we can store, some we have to collect annually, such as some of the maples.

Q. You indicated that the seed source number stays with the seed from collection through to plantation establishment. Why is that?

A. Well, there are two reasons. First,

this is a means that we ensure that the seeds or seedlings are well adapted to the local conditions which I spoke about where they will be sown and planted.

The second is, it's a means that we can maintain genetic variability, which is something I will be discussing shortly.

Q. You said that you ensure that seeds and seedlings are adapted to local conditions. What do you mean by local, in that context?

A. Well, by local in this context I am referring to seed zones. As a general rule only seed or seedlings will be used from the same seed zone, but there are some exceptions, such as long periods of time without cone crops, unforeseen problems with those cone crops from insects and there are problems with stock losses in certain cases.

Q. What happens if local seed or seedlings are not available?

A. Well, our practice is to control and minimize seed transfers. These exceptions are unique situations which require a flexible response on a case-by-case basis, and Mr. Waito last week had outlined one of those.

We have received an interrogatory on this

question which I believe we would like to file at this time.

MS. BLASTORAH: Yes, Mr. Chairman. We aren't going to refer to it other than to file it. It's OFIA Interrogatory No. 24.

THE CHAIRMAN: Exhibit 566.

---EXHIBIT NO. 566: OFIA Interrogatory No. 24 (Panel No. 11).

MS. BLASTORAH: Q. The second reason you gave for the use of a seed source number was to maintain genetic variability and you indicated you would be explaining what you meant by that. Could you do that now, please?

MR. BAKER: A. You may recall in Panel 10 Mr. Greenwood presented the concepts of phenotype and genotype, and we have to go back and refer to those two concepts.

By phenotype, what we mean is, is the tree that we see and it represents a tree's physical appearance. The phenotype is the result of the genetic constitution of the tree or its genotype as expressed by the environment in which the tree is grown in.

Now, there is a simple formula that is often used for presenting this concept and that is that the phenotype is a sum of the genotype plus

environment. The genotype is the genetic potential of the tree. We cannot see it directly and it can only be determined through well-designed tests.

What we mean by environment is a sum total of all the non-genetic factors. These would include such things as the site, the climate, moisture, that type of thing.

Okay. Now, to answer your question about what we mean by genetic variability. Genetic variation or variability is that portion of the differences among the phenotypes of trees in a stand which are directly attributable to differences among genotypes.

Now, to assess which portion of the differences among trees or stands are genetically or environmentally controlled we must undertake what we call genetic tests, and I will be talking about this a little later on.

But, for example, if you have two seedlings growing in the same proximity that have been sown at roughly the same time you have no idea if there are differences in growth rate, are they attributable to the genotype, the genetic potential, or are they just a result of the particular microsite those individual seedlings are growing on.

Inferences can be made that are based

upon the magnitude and pattern of variation, but the actual proof of genetic control and variation requires genetic tests in which the parentage is known. And really genetic tests are the key to a determination of the kind and control of variability that exists, and really the basic fact is we can't say anything definite about the genetic worth or genetic variation of trees just by looking at them.

Q. Why is it important to maintain genetic variability?

A. If we don't maintain genetic variability we limit the ability of the population or the stand to adapt to a changing environment, such as any unforeseen events or infestations.

Variability is a prerequisite to any tree improvement program as continual development in later generations will not be possible unless there is variation. This is because desired traits may change over time, but we select for traits that are economically important right now and in the foreseeable future.

Q. What procedures are used to maintain genetic variability?

A. Genetic variability is maintained through a number of mechanisms that maintain the

benefits of natural selection. These include the use of seed source controls which I have just talked about. This will ensure that a large number of trees contribute to the collection and that seed is collected from a number of different stands throughout the seed zone.

Also, there are special collection areas which I will be talking about in a moment. Seeds from these particular stands are used to regenerate and replace those stands.

Q. When you say those stands, which stands do you mean?

A. Those special collection areas.

Q. So the same areas?

A. The same areas will be regenerated with the previous stand seed.

Q. Thank you.

A. Also, the ability to store seed is a mechanism for maintaining genetic variability and this is done at the two seed plants that I have just described, plus there is a national tree seed centre at Petawawa which has a number of collections from Ontario.

Natural regeneration following logging and wild fire will maintain the status quo of the

existing forest genetic variability. There are also various reserves, such as areas of natural and scientific interest and wildnerness parks which were described in the evidence of Mr. Beechey in Panel 7, as well as there are riparian reserves, uncut areas of concern and various uncut stands which will all maintain genetic variability.

Q. Mr. Baker, in your opening remarks you indicated that the Ministry has embarked upon a tree improvement program and has in fact developed a provincial tree improvement strategy.

Would you please outline previously the purpose and structure of the tree improvement program?

A. As I mentioned in my opening remarks, the overall goal of Ontario's tree improvement program is to produce faster growing and better quality trees by improving the genetic potential of stock used in artificial regeneration.

The strategy that we have produced has been reviewed by many prominent, national and international forest geneticists and it is also our intention to have this document technically reviewed and updated every five years as new information on tree improvement and genetic techniques become available.

The tree improvement program has been

divided into two levels, the basic and the intensive program. The deployment of seed from these two levels will be dependent upon the level of management of the new forest.

You may recall in Panel 4 Mr. Gordon talked about the four levels of management for the new forest. They were the elite, the intensive, the basic and the extensive, and the seed or seedlings from our two levels of tree improvement program fit into those categories.

Seed and -- I should say seedlings from the intensive tree improvement program will be used in the elite and the intensive levels of management of the new forest. Seed from our basic tree improvement program will be used in the basic level of the new forest.

Q. What is the basic tree improvement program?

A. The goal of the basic tree improvement program is to sustain the genetic quality of the artificially regenerated species with at least the same level of genetic quality of the forest populations they replace, while at the same time aiming for a modest increase in genetic quality through appropriate seed source control.

In essence, what the basic strategy is is using seed source control, which I've just outlined, plus a number of special collection areas.

The basic program is the minimal amount of work required for native species that are regenerated artificially and these include those species that do not merit an intensive strategy and that would refer to species that just don't have enough genetic variation such as red pine, or that the artificially regenerate -- artificial regeneration program is relatively small, so they would rely on the basic program.

This basic program is viewed as an interim measure until the intensive program comes on stream, but it will also provide seed in the future for our direct seeding program. We don't suspect we will be using seed from the intensive program for direct seeding.

Q. Mr. Baker, in your written material you refer to special controlled collection areas under the basic program. Would you please briefly explain the difference between those special controlled collection areas?

A. Okay. There are three special collection areas that we are referring to. There are

the seed collection areas, seed production areas and gene pool reserves.

Now, seed collection areas are stands that are above average in form and vigor. They are normally large, relatively uniform stands that are mature or semi-mature and we apply no silvicultural treatments to these stands, but what we do is we identify them as high quality stands.

And we will go in and we will harvest either a portion of the stand or all of the stand and assign a unique seed source number to it. So in that last category, the seed source number would identify that it would be a seed collection area.

Now, seed collection areas are used primarily for jack pine and black spruce. And the purpose here is that we will collect seed from these high quality stands and put seed or seedlings back on the same site and then, if there is any surplus seed, it will be used to regenerate the adjacent stands.

Now, seed production areas are also high quality or above average in terms of form and vigor, but in contrast they are relatively small in size. They would be medium aged but sexually mature, and the intent here is that we will go in and do silvicultural treatments on these stands.

What I'm referring to there is that we will go in and we will selectively thin out the poor phenotypes, and we refer to this as roguing. In addition to doing roguing, we may do treatments to stimulate cone and flower crops such as fertilization.

The other important difference here with seed production areas is that we collect seed from standing trees.

Seed production areas are used primarily for white spruce and white pine which we can climb fairly safely.

So just to sum up the differences between seed collection areas and seed production areas, is that in the production areas we will go in and do silvicultural treatments to stimulate cone crops and also to remove the poor phenotypes and then we will collect cones from standing trees.

Now, the third category that I referred to were gene pool reserves, and these are an area or a population or a group of individuals that are considered significantly unique in some way and they are sufficiently important in its contribution to an artificial regeneration program.

Now, an example of this may be small isolated stands which are remnants of past larger

populations, such as white spruce in the southern portion of the area of the undertaking in the Ottawa Valley, or they could be individual stands that are at the extreme end of the range but they are also used in the artificial regeneration program, such things as yellow birch or maybe red spruce in Blind River District, for example.

THE CHAIRMAN: Would the 300-year-old white pine in the Temagami area be in that category?

MR. BAKER: Possibly, if they are considered significantly unique and also if they are going to be used for the artificial regeneration program.

THE CHAIRMAN: Are trees considered sufficiently unique if they are considered the oldest remnants of a particular specie that's left in an area, even if they aren't going to be used for an artificial regeneration program?

MR. BAKER: By our definition in the tree improvement program, no, we wouldn't use that criteria.

THE CHAIRMAN: Thank you.

MR. BAKER: The one problem I should mention is that with older trees you tend not to get very many cones or seed, and so if you are using them for an artificial regeneration program, it's very

difficult to collect the quantity you want and, two, it's difficult to collect if you are going to go in and climb those trees which may be a possibility.

And I guess the third point I should make here is that even though they are called gene pool reserves, what we are trying to do is conserve them, but we are not necessarily preserving them. So there will be harvesting activity of tnose stands over time, but what will happen is that we will use seed from those collections to put back on the same site.

So, in essence, what we have done is maintained the status quo of the genetic potential.

MS. BLASTORAH: Q. Mr. Baker, the example the Chairman gave you from the Temagami District, would you consider those within the definition of small isolated stands that you had given at the outset of your discussion of gene pool reserves?

MR. BAKER: A. I don't have any experience in that particular area, but from what I have read, yes, they may possibly fit into that category of being small isolated stands.

Q. Thank you. How does the intensive program differ from the basic program you have just described?

A. Okay. The intensive tree improvement

program concentrates on individual trees. In other words, what we are talking about in the intensive program is tree level management versus the stand level management that I have been talking about in the basic program. And in the intensive program we have more stringent controls over the parentage.

I would just like to sum up what the goals are of the intensive tree improvement program, and these are: A significant increase in both production and quality of plantations which will be achieved and sustained for the most -- for most of our commercially important species by planting trees which will be genetically enhanced by means of repeated cycles of selection and breeding.

So I think the key point here, Mr. Chairman, is repeated cycles of selection and breeding.

Q. Can you expand on that, Mr. Baker, and explain what you mean by more stringent controls on parentage and individual tree selection?

A. Well, as I have stated, in the intensive program we concentrate on individual trees from which the seed or scions, and what I mean by scions is twig material that can be taken from these individual trees and grafted. These will be collected for breeding and for testing purposes.

In the basic program, the seed is collected by stands and is bulked by seed zones for general collections or it's identified by stands for the special collection areas.

Now, getting back to the intensive program. It can essentially be described in four areas which I will go over this morning. One is plus tree selection, the second is propagation of material from those individual plus trees, the third area are genetic tests, and then the fourth area are seed orchards.

Q. Briefly, what is plus tree selection?

A. Plus trees are individual trees that are identified and selected in stands based upon their external appearance or their phenotype. Now, the trees are selected for traits that are under a reasonable degree of genetic control, but also they may -- they must have some economic importance. There is no sense of selecting trees that have characteristics that are under high genetic control if they are not commercially important in our program.

The traits we are concentrating on are rate of growth, form - both stem and branch form - and wood quality properties. However, the traits do vary by species and the traits used for plus trees in Ontario are outlined in the witness statement in Table

1 on page 582. I just bring that to your attention, I have no intention of going through it at this time.

Q. Where do you go to select your plus trees?

A. Well, prior to any plus tree selection we must outline the area that we will be doing the selections in and this geographic area is normally referred to as a breeding zone, and this is the area from which selections will be made and interbred.

Now, the Ministry of Natural Resources has identified breeding zones across the province based upon the same general information that we have used for the seed zones; in other words, response to climate and land forms. However, the difference between breeding zones in the intensive program and seed zones under our basic program relates primarily back to species or breeding zones may vary by species, especially if we have any information from the provinence test; whereas seed zones are used for all species.

Q. Another one of the essentials of the intensive program you mentioned was seed orchards. What are seed orchards and how do they relate to plus tree selection?

A. Seed orchards are special plantations

of selected trees that are established primarily for the production of genetically superior seed, and these can either be from seedlings or from grafts that we obtain from the plus trees.

Q. Are there different types of orchards?

A. Yes, there is two primary classes of orchards. There are production seed orchards and then there are breeding orchards.

Now, the production seed orchards are designed for randomating and open pollination, and these can essentially be described as a seed factory and the concept of fruit orchards that you have in southern Ontario is a similar concept to our production orchards.

Now, in contrast to that there are breeding orchards and these are designed for controlled pollination to produce pedigreed families for genetic testing, and the reason we set up these breeding orchards is so that we can more efficiently create these pedigreed families through controlled pollinations.

Now, just going back to the production orchard, there are also two levels of production orchards. There are seedling seed orchards which are

established with seedlings, and then there are clonal seed orchards which are established with grafts. And the choice of the orchard type is determined primarily by the silvical characteristics of the species, but also by economic and logistical reasons.

MS. BLASTORAH: Mr. Chairman, there is some more information on that contained in Table 2 at page 584 of the witness statement. I don't think we will go into that this morning.

Q. Mr. Baker, earlier you indicated that seed orchards are established primarily to produce genetically superior seed. By establishing these production seed orchards, are you assured of greater genetic improvement?

MR. BAKER: A. No, that is not the case, and this can only be achieved by establishing tests to determine the breeding value of the resulting trees in the orchards, and what I mean by breeding value is the potential for producing better offspring.

Now, for most of the traits in our natural forest, the tree's phenotype is a poor indicator of its breeding value. Currently the only way we can judge the breeding value of a plus tree is by observing the performance of its progeny in a field trial, specifically a genetic test.

Q. Is that the only purpose of these genetic tests?

A. No. The function of a genetic test is to evaluate the performance of trees in a seed orchard by providing data necessary to do the roguing or selectively thinning out the poorer progenies from a production seed orchard.

Roguing the orchard based upon genetic tests results in an increase of favourable genes of the trees that will be parents for the selected traits.

In addition, genetic tests are used to provide estimates on the degree of heritability of the traits under selection, they are also used as a source of material from which selections may be made for future or following generations and, in addition, the genetic test can estimate the level of genetic gain that might be achieved.

The bottom line is, if we are undertaking an intensive tree improvement program, we must do genetic tests.

Q. Are different types of genetic tests used in the area of the undertaking?

A. Yes. There are two main types of genetic tests that we use and these relate back to the different seed orchard types which I have mentioned.

For seedling seed orchards, we use what are called open pollinated family test, and for the clonal seed orchard program we use controlled pollinated progeny test. And I don't think I will go into any detail at this time on the differences. All I will say is that the tests in both cases are usually put out on three to four sites within a breeding zone and that the tests themselves are conducted using good experimental design so that we can determine the differences between the genetic potential of a tree and the environment.

MS. BLASTORAH: Mr. Chairman, again there is more information in the witness statement contained at pages 586 to 587.

Q. Who is responsible for the delivery of the tree improvement program in the province?

MR. BAKER: A. It's a multi-faceted program within MNR and both our main -- or I should say our main office, our regions, our districts and our research branch are all involved.

In addition, the forest industry is involved in the tree improvement program through two cooperatives. In addition, external agencies such as the Canadian Forestry Service and a number of universities are involved in providing research and

development support.

Now, within MNR in the main office group, there is the Tree Seed and Forest Genetics Unit which is responsible for policy and procedures for seed collection and tree improvement. They have produced the Tree Improvement Master Plan and, in addition, they provide scientific support.

Now, the regions develop specific plans and programs to meet the regional requirements within the framework of the Tree Improvement Master Plan and then the districts get to carry out the work.

As I mentioned, there is also two cooperatives, these are the Ontario Tree Improvement Council and the Northshore Cooperative in which the Ministry of Natural Resources and the forest industry both share work and responsibility for their various tree improvement programs.

Q. In general terms, what is the status of the tree improvement program in Ontario?

A. Our program currently is in the early stages of development and efforts to date have concentrated in the basic program setting up seed collection, seed production areas, as well as gene pool reserves.

In the intensive program, our efforts are

concentrating on plus tree selection, propagating that material, putting it out into genetic tests and in seed orchards. None of our production orchards have been rogued to date because our tests are not old enough. I suspect within the next five-year period we will begin to rogue those production orchards.

By comparison, programs elsewhere in the world are into their second and there are a good number into their third generation program. In other words, they have gone through that cycle of selecting and breeding three times. The current status of Ontario's tree improvement program can be found on page 591 of the witness statement.

MS. BLASTORAH: Mr. Chairman, there is a correction to the bottom of that Table No. 3. We have corrected copies here for both the Board and the parties.

Q. Perhaps, Mr. Baker, you could just indicate briefly what the corrections or changes are?

MR. BAKER: A. Yes. If you look at the bottom line, it talks about genetic tests and unfortunately when we put the table together we used the number of tests not the area as the table indicated it would be an area. So that's the reason for the correction.

MS. BLASTORAH: I would like to file the corrected copy of Table 3 at this time, Mr. Chairman.

THE CHAIRMAN: Very well. That will be...

MS. BLASTORAH: I believe it's 567.

THE CHAIRMAN: Right.

MS. BLASTORAH: (handed)

THE CHAIRMAN: Thank you.

---EXHIBIT NO. 567: Corrected copy of Table 3 found at pae 591 of Panel 11 witness statement.

MS. BLASTORAH: Q. Mr. Baker, I believe it's both of the two last lines which are both under genetic tests on the table; is that correct?

MR. BAKER: A. That is correct.

Q. Thank you. Are seed collection and tree improvement part of timber management planning under the timber management planning manual?

A. Yes, they are. There are various tables in the timber management plan that report on seed collection by species and seed zone. They also report on seed collection and seed production areas that are established or maintained. They also identify plus tree selection and the establishment and maintenance of both genetic tests and seed orchards.

For example, there is Table 4.5 which is the report on tree improvement support and this whole topic will be discussed in Panel 15 I understand.

MS. BLASTORAH: We don't intend to go into that, Mr. Chairman.

Q. In your evidence you indicate that the acquisition of and deployment of seed in an artificial regeneration program has the potential to be either negative or positive in three areas. Could you expand on that?

MR. BAKER: A. The three areas that we have potential effects are: One, the deployment of genetic variability at the stand or population area level. The second level is the change in genetic variability within the new forest gene pool, and the third area is conservation of genetic resources within populations and local stands.

Q. What do you mean by deployment of genetic variability?

A. As I mentioned earlier, the choice of seed source has the potential to be either beneficial or detrimental. Local populations through the process of natural selection have become adapted to the local environmental conditions which they grow and reproduce. The use of seed zones is a control process designed to

minimize or eliminate the use of inappropriate seed sources.

Similarly in our intensive tree improvement program breeding zones will also maintain local adaptability. Provinence testing and genetic test results may in the future indicate where non-local seed may be appropriate.

To really sum up what I mean here, a good example would be if you took seedlings from southern Ontario, let's say your backyard in Toronto, and tried to grow them in Red Lake, the problem you would have is, one, the seedlings may not survive but even if they did, you would have poor growth and there would be a loss in vigor.

Q. What are you referring to by conservation of genetic resources within populations and local stands?

A. Conservation of the genetic resource of the preferred species is an integral part of both the intensive and basic programs.

In the basic programs the special collection areas that I have referred to, seed collection, seed production areas, gene pool reserves are required to be regenerated with their own seed. In the intensive program, breeding orchards and genetic

tests are a reserve of genes that have been sampled from the original population.

The total area treated with genetically improved material will be relatively small in the overall regeneration picture. In addition, natural regeneration following logging or wild fire will maintain the status quo of the existing forest trees' gene pools. In addition, there are areas of natural and scientific interest, wilderness parks, riparian reserves and uncut stands that will provide a future source of genetic material.

Q. And finally, Mr. Baker, you listed as a potential effect changes in genetic variability. Again, what do you mean by that?

A. Well, first of all, without variability there is no basis for a tree improvement program or for long-term adaptability of natural populations. We need to maintain genetic variability.

At the seed zone or seed source level gene collections ensure that a large number of trees contribute to the seed from a given seed zone. In addition, since collections occur from more than one stand in a seed zone, mixing of seed from the same seed zones serve to increase genetic variability.

I guess the point I should make here is

that even with natural stands they tend to develop in small communities or neighbourhoods and by collecting cones from across the seed zone and mixing those seeds from different stands we tend to break up those neighbourhoods and this will increase genetic variability. This should, and this will ensure that our plantations will have just as much genetic variability as the original stands.

At the stand level, genetic variability can and is being maintained through the use of seed selection areas, seed production areas and gene pool reserves. And at the intensive program, genetic variability is maintained by bringing together selections from across the breeding zone and allowing them to outcross, and by outcrossing what I mean is mating of unrelated individuals and this -- by this we will increase genetic variability. Also breeding for broad adaptability will maintain genetic variability through the long run.

And I should point out that even after plantations have been established with improved seed, they will still look variable and be quite variable. We are not creating anything new that has not already been in the forest before, but rather we are increasing the frequency of more economically desirable trees.

MS. BLASTORAH: Mr. Chairman, that is all my questions for Mr. Baker. Perhaps we could take a short break at this time and I believe we are going to proceed to the next witness, Dr. Allin.

MR. FREIDIN: And, Mr. Chairman, I think if we do take a short break - I'm not sure what your plans -- we are going to sit until two o'clock today?

The reason I ask is that if we take a short break and maybe grab a chocolate bar, we can finish this panel today. There's a chance we might do that.

MS. BLASTORAH: The panel?

MR. FREIDIN: Yes, the panel.

THE CHAIRMAN: Don't fight over it, counsel, don't fight over it.

MS. BLASTORAH: He's doing the rest of the witnesses. I had no idea he was so efficient.

THE CHAIRMAN: Okay. Well, why don't we -- would it be possible at this point to take a half hour break like for lunch and would you still finish around two; do you think, 2:15?

MR. FREIDIN: It might be tight then. I am sort of estimating. It would be tight if we just had two hours.

MS. SWENARCHUK: You have Monday.

MR. FREIDIN: We have Monday, I suppose that's true. All right. Perhaps we will just take the usual break, if you want.

It looks like we are going to have lots of time next week to finish the cross-examination, that was one of my concerns as well, subject to being advised that Mr. Hanna or another representative of OFAH will be here.

THE CHAIRMAN: We haven't ascertained that ourselves yet. So why don't we take 20 minutes at this point and then we will come back.

---Recess taken at 11:25 a.m.

---On resuming at 12:05 p.m.

THE CHAIRMAN: Thank you. Be seated, please.

MR. FREIDIN: All right.

Mr. Chairman, I would like you to grab your chair. I would like the reporter to point her stenotype machine in capital letters and record the fact that: I HAVE NO QUESTIONS FOR MR. GREENWOOD.

MR. MARTEL: Wait until I get up off the floor.

MS. SEABORN: We will try and think of some, Mr. Freidin.

MR. FREIDIN: Dr. Allin is going to be

the next witness. Just a brief errata. There's a couple of incorrect dates in relation to the photos on page 808. Photograph No. 6, the date should be August, '85; photograph No. 7 should be '85; photograph No. 8 should be '86; and on page 810, photograph No. 9 should be 1988.

DIRECT EXAMINATION BY MR. FREIDIN:

Q. Now, Dr. Allin, could you outline the major messages that you would like to convey in your evidence today?

DR. ALLIN: A. Yes. If I could have someone to turn off the lights, please, and turn on the projector. I have a slide that lists the major messages that I would like to leave with the Board.

The first message is that in the short term the potential effects of renewal operations may be either positive or negative and when I say short term here, I should explain that really what I am talking about is the site preparation component of renewal because the potential effects of site preparation occur early in the period of renewal and last, at the most, a few years.

The potential effects of site preparation depend among other things on the form of site preparation and, as Mr. Kennedy indicated earlier,

there are three forms of site preparation that are used in Ontario; mechanical site presentation, prescribed burning, and chemical site preparation.

I am going to be addressing the potential aquatic effects only of the first two of those; mechanical site preparation and prescribed burning. The potential aquatic effect of chemical site preparation will be discussed in Panel 13.

The other point in this message is that the direction of potential effects depends on the magnitude, duration and frequency of effects and by direction here I am really referring to whether the effect is positive or negative for the aquatic environment.

This message is very similar to one that I presented earlier in harvest evidence in Panel 10 and in many ways - and I will expand on this a little later - the potential effects of site preparation are similar, at least in nature, to the potential effects of harvest.

The second message is that in the long term the potential effects are generally positive.

MR. FREIDIN: Dr. Allin, perhaps I should just interject for a moment, Mr. Chairman.

I forgot that we do have a copy of these

overheads and some people may wish to write on the overhead as opposed to in their notebook. Perhaps we could mark a copy of these overheads, and there are a number of them, as the next exhibit.

THE CHAIRMAN: Very well. Exhibit 568.

---EXHIBIT NO. 568: Hard copy of overheads used in Dr. Allin's presentation.

MR. FREIDIN: (handed).

THE CHAIRMAN: Thank you.

MR. FREIDIN: What exhibit number is that, Mr. Chairman?

THE CHAIRMAN: 568.

MR. FREIDIN: Q. All right. I'm sorry, Dr. Allin.

DR. ALLIN: A. Referring to the second message which is that in the long term the potential effects of renewal are generally positive. What I mean here by the long term is really the effects of the other component of renewal, that is regeneration.

Regeneration reduces many of the potentially negative effects of harvest and site preparation as well. And an example of that would be the growth of a new forest which re-establishes shade along a stream and may also reduce any loss of nutrients or sediment that may have occurred as a

result of the harvest or site preparation operations. So, in effect, regeneration reverses many of the effects of both harvest and site preparation.

The third message is that many potential effects of site preparation may be additive to those of harvest and what I mean by that is that site preparation can potentially have many of the same kind of effects as do harvest operations. And an example of that would be that prescribed burning removes either all or part of the vegetation remaining on a site after harvest and so that can have some of the same effects as the harvest itself. And one of those effects, for example, could be increased water yield.

The other point here is that since site preparation is usually carried out within say one to two years following harvest, the effects of the site preparation activity occur and at the same time as similar effect of harvest is still on-going, such as the increase in water yield. So in that sense also the effects are additive.

The fourth message is that some potential effects of site preparation are similar in kind to those of natural disturbance and the obvious example of that is the similarities between prescribed burning and wild fire. Examples of those effects would be

potentially increases in water yield and nutrient inputs to water courses.

The fifth message is that the significance of effects in Ontario is uncertain. There is scientific uncertainty about the effects of renewal operations. And, as I indicated in Panel 10 with harvest evidence, we do know something about the effects of renewal in a qualitative sense, we understand many of the cause/effect relationships that are involved, but there is uncertainty about the magnitude, duration and frequency of effects because those parameters have not been quantified in Ontario.

The sixth message is that the major tool to protect aquatic values is the Fish Habitat Guidelines. As again I mentioned during Panel 10 on harvest evidence, the Fish Habitat Guidelines are not the only tool to protect aquatic values, there are other things as well.

The Code of Practice being one, it was discussed in Panel 10, and also the use of other guidelines such as the Tourism Guidelines, or Moose Guidelines which also may offer additional protection to aquatic environments.

The last message is that the guidelines are believed to be effective in preventing or reducing

negative effects. I again can't say with scientific certainty that the guidelines are effective, but I believe that they are effective based on the fact that they were developed using the best scientific and other information that was available to us and also on the fact that the way in which the guidelines are used reflects a conservative approach to protection of aquatic values and, again, the actual effectiveness of the guidelines will be examined in the effects monitoring program which will be discussed in Panel 16.

MR. FREIDIN: And perhaps we could have the lights turned back on.

Dr. Allin, when you presented your evidence on harvest in Panel No. 10, your first message was that there was, and I am quoting:

"...much information exists about potential effects of timber harvest on the aquatic environment."

You didn't present the same message for renewal. Could you explain the reason for that?

DR. ALLIN: A. Yes. That message would not be true for renewal, in my opinion. Compared to harvest, there is considerably less documented information in the literature about effects of renewal.

As I indicated in Panel 10, there have

been a fairly large number of studies in many jurisdictions in which investigators have looked at both potential and actual effects of harvest on the aquatic environment, but in most cases those investigators or other investigators have not looked at the subsequent effects of renewal.

So basically there is considerably less information on the effects of renewal than there is for harvest.

Q. Does a lack of extensive documented information on the potential effects of renewal affect your confidence in the conclusion which you described in Message No. 7 and that was that the guidelines are believed to be effective in preventing or reducing negative effects.

A. No. I would expect that proper use of the Fish Habitat Guidelines will prevent or minimize the negative effects of renewal.

The guidelines direct that either no cut reserves or areas in which only selection cutting is permitted be maintained on many shorelines or many riparian areas. And so those areas will help to protect against potentially negative effects of renewal as well as harvest.

In other words, the protection that is

provided in the guidelines with respect to harvest will also be effective in providing protection against potentially negative effects of renewal.

Now, there are some situations in which harvesting does occur in riparian areas and the guidelines allow for that. So that in those cases where subsequent renewal operations occur in riparian areas, that is where good practice such as described in the Code of Practice that we discussed in Panel 10 would be used and those good practices will also help to reduce the potential for potentially negative effects of renewal operations.

Q. Can you advise how the information on potential effects of renewal on the aquatic environment was obtained?

A. Well, basically we used the same sources of information that I described in Panel 10 for the way in which we obtained information on harvest.

Q. All right. And without describing them in any detail, can you just provide a list of those sources?

A. Yes. Basically they were use of the scientific literature, the information obtained through the ESSA workshops, talking to experts both inside and outside the Ministry, and the fourth source was local

observation and experience of myself as well as others.

Q. Now again, as you did in Panel No. 10, you have relied on a number of studies from outside of Ontario. In your view, are those studies relevant?

A. Yes, I believe they are. I indicated in Panel 10 why studies from outside Ontario are relevant and useful to us, at least in some respects. In that case it was with respect to the potential effects of harvest, but that same evidence that I presented in Panel 10 applies to potential effects of renewal as well.

Q. Could you advise: What are the potential effects that you are going to be addressing in your evidence today?

A. Yes. I have a slide that lists them. If I could have the lights, please.

MR. FREIDIN: This is a slide which forms part of 568 just entitled: Topics, Mr. Chairman.

THE CHAIRMAN: Thank you.

DR. ALLIN: These are the topics that I will be addressing, they are basically the topics that are listed in the Table of Contents in the written evidence. They are also identical with the topics that were discussed in evidence-in-chief for harvest.

I will speak briefly to each one of them,

clarify some points, in some cases expand on some material from each one of them.

If I could have the lights back on, please.

MR. FREIDIN: Q. You indicated earlier that both the Fish Habitat Guidelines and the Code of Practice are used to prevent or minimize adverse effects. Without the use of those tools, can you say whether the potential effects of renewal on the aquatic environment would be positive or negative?

DR. ALLIN: A. Yes. In answering that though, I need to distinguish between site preparation and regeneration because the potential effects of those two components of renewal are really quite different.

Talking about site preparation first. With the exception of erosion and sedimentation, whose effects are never positive, almost all of the other effects of site preparation have the potential to be either positive or negative and what that really means is that when the magnitude of the effect is small the effect may actually be positive with respect to the aquatic environment, but the effect can become negative when it occurs in too large an amount or over too long a period of time. And, again, that's very similar to a point that I made in the presentation of harvest

evidence.

In terms of regeneration the situation is quite different. Regeneration, as I indicated earlier, reverses many of the potential effects of both harvest and site preparation. So again, it does have the potential to be both positive and negative, but as I indicated in Message 2, when you look at the effects of regeneration overall, they are generally positive.

Q. In considering the potential effects of site preparation as distinct from regeneration, do you know under what circumstances each of the various effects that you referred to move from being negative to positive?

A. Not in any precise way. Again, as I indicated in the harvest, we do know something about habitat requirements of some species of aquatic life, particularly fish. We also understand the nature of many of the effects of renewal operations and an example of that would simply be the removal of shade increasing water temperatures in summer and that would happen whether the shade was removed as a result of harvest or, say, prescribed burning.

But the effects haven't been quantified in Ontario and the result of that is that we can't say when the effects of site preparation would move from

being positive to negative.

Q. In your evidence on harvest you described how the Fish Habitat Guidelines are conservative in nature. Does the conservative nature of the guidelines address the potential effects of site presentation?

A. Yes, it does. As for harvest in applying the Fish Habitat guidelines, we essentially try to minimize change even though at times a change, if it's a small effect, may actually be positive. In other words, we try to error on the side of safety and provide a level of protection that would be sufficient to protect aquatic values in almost all situations.

Q. Will you then move to the first topic that you indicated you would deal with, water yield.

THE CHAIRMAN: Dr. Allin, just before you go to that, you have mentioned a couple of times now that in Ontario effects haven't been quantified and, therefore, there is some degree of uncertainty as to whether they are positive or negative.

Have they been quantified in any other jurisdiction to your knowledge?

DR. ALLIN: Yes, to some degree, but again, when we look at the documented information in the literature for renewal, certainly that body of

information is less for renewal operations than it is for harvest.

But yes, there are certainly a number of studies which have looked at a number of effects of renewal on the aquatic environment. So information does exist in other jurisdictions and a little later on I will have a couple of examples of that.

THE CHAIRMAN: Are they applicable to this jurisdiction or are they that site-specific?

DR. ALLIN: Well, certainly they are site specific but they do -- they are useful in certain ways in terms of identifying potential effects and particularly in the case of site preparation in confirming our understanding of how the type of site preparation and particularly the intensity of that site preparation affects the potential for effects.

MR. FREIDIN: Q. Could you explain how renewal activities may potentially affect the water yield?

DR. ALLIN: A. Yes. Again, if someone could get the lights and projector for me, please.

Q. And I think you'll be referring to Exhibit 568, the page titled: Water Yield.

A. Again I would like to distinguish between potential effects of site preparation and

regeneration and dealing with site preparation first, the potential effects of site presentation on the hydrologic cycle are similar in kind to those of harvest which I discussed in Panel 10. So I won't go into those in much detail.

Certainly I would expect the effects of site preparation in terms of water yield to be considered less than for harvest, in most situations. The effects that -- or the ways in which effects on water yield occur are basically through removal of vegetation from the site; this is vegetation that is left on the site following harvest.

And now obviously looking at harvest as opposed to site preparation, harvest normally would have a much larger effect in terms of removing vegetation from the site, particularly vegetation that will have a considerable degree of control over water yield and stream flow, such as trees which are deep rooted and have more foliage and so on.

But having said that, to the extent that site preparation does remove additional vegetation from the site, it may also increase stream flow because of the reduced evapotranspiration by vegetation that remains on the site.

Now, the site preparation may increase

stream flow both, as it indicates on the slide, during storm events, during periods of low flow. The effects at those different times are different. The effects of higher peak flows are potentially negative and, again as I indicated in the harvest, that is largely because of the potential for scouring of the stream channel itself leading to potential erosion and, in some cases, washout of fish eggs or invertebrates.

On the other hand, the effects of higher low flows are potentially positive because that can provide additional living space for aquatic life.

The potential for increased stream flow as a result of site preparation depends of course on the amount of vegetation that is removed and that, in turn, depends on the form of site preparation as well as the equipment that's used.

Now, both mechanical site preparation and prescribed burning may increase water yield and, in both cases, the potential for water yield effects depends upon the intensity of the treatment, and by intensity here I am referring basically to the amount of residual vegetation that is removed from the site.

Generally the more intense the treatment the larger the potential effect on water yield. And to give you an example -- or a couple of examples of that,

you would expect that blading, which removes a considerable amount of vegetation from the site, would have a larger effect on stream flow than would patch scarification, for example, because patch scarification removes relatively little residual vegetation. Another example would be that you would expect a moderately intense fire to have a larger effect on stream flow than would a less intense fire.

So that's the kind of thing that I am referring to here and basically the point is that the intensity of treatment is an important factor in that respect.

Moving to regeneration, Point 2. The potential effects of regeneration are basically just the opposite of site preparation. As the site regenerates, the growth of the new forest increases the rate of evapotranspiration, so that has just the opposite effect of site preparation. There is now less moisture in the soil, less water available for stream flow. So regeneration reduces stream flow reversing the potential effects of both harvest and site preparation.

Again, referring to peak flows. The effects of lower peak flows are potentially positive and, again, that relates to just reducing the potential

for scouring. The effects of reduced low flows are potentially negative because of the potential for reducing living space for whatever organisms are present.

With respect both to site preparation and regeneration, the significance of effects in Ontario is uncertain and, again, that is because the magnitude and duration of effects have not been quantified.

Q. Do you want me to turn the projector off?

A. Yes.

Q. The next topic is erosion and sedimentation. I understand that the OFIA/OLMA asked a number of interrogatories relating to this section of your paper, Dr. Allin?

A. Yes, that's correct.

Q. And you would like to speak to the interrogatories from OFIA, Nos. 30 and 31 I believe.

A. Right.

MR. FREIDIN: I would like to file those two interrogatories and the answers thereto as the next exhibit, Mr. Chairman.

THE CHAIRMAN: Exhibit 569.

---EXHIBIT NO. 569: OFIA/OLMA Interrogatory Nos. 30 and 31 and answers thereto (Panel No. 11).

MR. FREIDIN: Q. Dr. Allin, can you provide the Board with some particulars of those interrogatories and the answers that were provided?

DR. ALLIN: A. Yes. Both of those interrogatories refer to page 783 of the evidence, the second full paragraph and the first two sentences, and perhaps I just will read those two sentences. They read:

> "The potential for erosion is greatest where extensive exposure of highly erodible soils occurs on steep slopes. Avoidance of such slopes, together with careful choice of equipment and operating methods near waterbodies, can significantly reduce the potential for erosion and sedimentation."

Now, the first of the two interrogatories; that is No. 30, asked: What is meant by the term steep slope in the context of those sentences. And that is a difficult matter to define precisely.

As the answer indicates, the term steep slope can't be defined precisely in quantitative terms; in other words, in terms of a degree of slope or a per

cent slope. It is a matter of some opinion probably when a moderate slope becomes a steep slope. I think the important point here is really in the second sentence of the answer which reads:

> "The potential for soil erosion increases with increasing slope if the surface organic layers are removed."

And the relationship between steepness of slope and erosion potential is described in the Code of Practice.

The second interrogatory of the two, No. 31, asks that: Locations be identified in northern Ontario where the two conditions of steep slopes and highly erodible soils occur together and in what percentage of the area of the undertaking those conditions co-exist.

Now, as the answer indicates, the Ministry does not keep a record of the location -- of locations where those conditions occur together; that is, highly erodible soils and steep slopes. The two conditions are found where either wet soils or fine textured soils are situated on steep slopes, and a couple of examples are given of where that does occur near the Pik River and the Englehart River, and in both those situations it is a matter of silty soils

occurring on steep slopes.

The second part of the question asked us to indicate in what percentage of the area of the undertaking those conditions co-exist. Again, it is not possible for us to indicate the percentage of the area of the undertaking where that occurs.

In discussing this matter with a number of field staff in the Ministry, the clear consensus here was that, at least in general terms, steep slopes and fine textured soils probably occur together in a very small percentage of the area and the co-existence of steep slopes and wet soils, likewise, is very rare simply because steep slopes are typically well drained. So you would not expect to find a wet soil on a steep slope.

Q. Is the potential for erosion limited to the conditions referred to in the two sentences that you quoted to us; that is, a situation where steep slopes and highly erodible soils occur together?

A. No, it isn't, and I think this is the important point of this whole discussion. The situation described in the statement of evidence about highly erodible soils and steep slopes is the situation which the potential for erosion is greatest, but there are other situations where erosion could potentially

occur; situations, for example, where slopes are more moderate or where soils are not necessarily highly erodible.

So there are other sites where there is a potential for erosion, although certainly that potential is less than the situation that's described in the evidence -- in the written evidence rather.

Q. Is there any significance of the fact that other conditions exist other than the ones described in the interrogatory question where there is some potential for erosion?

A. Yes. I think it means that wherever there is a proposal to carry out mechanical site preparation near a watercourse, some thought should be given to the potential for erosion and sedimentation and that basically care should be taken wherever it is necessary in order to minimize potential for erosion and sedimentation.

Q. On page 783 that you quoted from, the last sentence indicates that, and I am quoting:

"When using equipment that creates furrows in the soil, the risk of sedimentation is reduced by orienting furrows at right angles to the slope."

Is this practice addressed in the Code of

Practice?

A. Yes, it is. In the Code, one of the ways to reduce the potential for erosion when operating on a slope is to follow slope contours when using heavy site preparation equipment, and those latter words actually appear in the Code.

Q. Now, in your paper you refer to the study by Blackburn, a 1982 article, in several places. Could you explain for the Board how and why you have used that particular study?

A. Yes. The Blackburn study is virtually the only study I could find which quantified the effects of mechanical site preparation on the aquatic environment.

Q. So that goes to answering, I guess, one of the Chairman's earlier questions?

A. That's right. It is perhaps a good example of that. This particular study, Mr. Chairman, was carried out in east Texas. Obviously there are large differences between conditions in Texas and Ontario and so, in using a study like this, you obviously must be careful in how you interpret and use the results.

And in citing this particular study I don't mean to suggest that the results are similar

quantitatively to what might happen in Ontario. In other words, there is no intention to say that, for example, the amount of sediment that ended up in the streams in Texas as a result of mechanical site preparation would be the same or necessarily even similar to what might happen after a mechanical operation in Ontario.

But having said that, I think that the results of this particular study are useful to us in two main ways. First of all, the study helps to identify certain potential effects, and they addressed a number of effects on the aquatic environment as a result of the operations that they carried out. So that's one thing, it helps to identify potential effects.

Perhaps more importantly, the study also demonstrates the influence of the intensity of the site preparation treatment on aquatic effects, and by intensity in this case I am referring to the proportion of mineral soil that's exposed and also to the residual vegetation on the site that's removed.

Basically, with respect to that point, the intensity of the treatment; the more intense the treatment, the greater the potential for erosion and sedimentation because of the greater mineral soil

exposure, the removal of residual vegetation, and also because the slash may be removed with some kinds of treatments or it may be aligned.

So the Blackburn study demonstrated this relationship between intensity of effect and the -- sorry, intensity of treatment and the potential for effects quite well and, in a sense, confirms our understanding of that relationship between intensity of treatment and potential for effects.

Q. You indicated that in citing the Blackburn article you didn't mean to suggest that the results of that study were similar quantitatively to what might occur in Ontario. To which results identified in the Blackburn Study does that comment apply?

A. It applies to all of the effects that are cited in the Blackburn Report. Blackburn and his co-authors looked at three major kinds of effects, erosion and sedimentation, water yield, and input of nutrients to watercourses and so my comment applied to all of those three types of effects.

Q. Okay. Could you advise whether the Fish Habitat Guidelines have any effect on the use of mechanical site preparation near waterbodies?

MS. CRONK: Sorry, can I have the

question again, please?

MR. FREIDIN: Q. Does the Fish Habitat Guidelines -- do the Fish Habitat Guidelines have any effect on the use of mechanical site preparation near waterbodies?

DR. ALLIN: A. Yes, they do. The use of the Fish Habitat Guidelines results in the maintenance of reserves; that is, no-cut reserves or areas with only selection cutting within them on many, but certainly not all, riparian areas and where that occurs mechanical site preparation is not carried out in those areas.

So, consequently, mechanical site preparation is not carried out in many riparian areas. It would be carried out only behind the reserve. However, there are some situations where harvesting does occur in riparian areas and that would be most common near warm water lakes and streams and, in those cases, mechanical site preparation may be carried out in those particular riparian areas where the harvest has occurred.

Q. Mr. Kennedy, could you advise: Is protection of the aquatic environment considered in developing prescriptions related to mechanical site preparation near waterbodies?

MR. KENNEDY: A. Yes, it is. As I had mentioned in my evidence, that in addition to specific site conditions, the environmental considerations and considerations for other users are factors that are considered when developing prescriptions for areas and when choosing between site preparation methods.

For instance, near watercourses, one of the primary concerns would be to obtain the degree of disturbance necessary for the successful establishment of trees while protecting the aquatic environment.

This concern has been expressed by Dr. Allin as the intensity of treatment and may result in a selection of a less intense treatment such as a Bracke.

Q. And is this decision regarding the prescription recorded and, if it is, how specific is it recorded in terms of the actual operations that will occur?

A. Those decisions are made through the area of concern planning procedure, and the analysis that occurs during that procedure would result in a specific prescription for a specific area, and that result or that decision would be recorded in the area of concern documentation which would be part of the supplementary documentation in a timber management plan.

Q. And I understand in terms of the specificity there will be some examples in Panel No. 15?

A. That's correct.

Q. Could you just give an example of the degree of specificity that you might find?

A. Yes. In many plans you can find in the supplementary documentation the decision to use a particular piece of equipment in an area of concern, and you may go so far as to indicate season of operation and the time of year in which that equipment would be used in those areas, as well as the orientation of the equipment.

Q. Okay. Once you are on a site, are there actions which may not be specified in the prescription which can be considered and, if appropriate, be implemented in order to reduce the potential for adverse effects on the aquatic environment?

A. Yes. I think Dr. Allin made reference already to the fact of using good practices, such as operating patterns being tailored to the contour of the land. Practices like these are described in the Code of Practice.

Q. Thank you. Dr. Allin, when mineral

soil exposure occurs as a result of site preparation, is it necessary that trees be re-established to reduce the potential for erosion as opposed to the establishment of other vegetation?

DR. ALLIN: A. No, it is not necessary that trees be re-established because the growth of other kinds of vegetation also helps to stabilize the soil. What is important is to re-establish foliage which intercepts rainfall and also to re-establish roots which help to stabilize the soil.

Q. Can we move on to the next topic of organic debris. Again, I think that is the last overhead which is in Exhibit 568.

In your paper at page 787, you indicate that both site preparation and regeneration may result in increased inputs of organic debris to waterbodies. What is the significance of those potential effects?

A. Could I have the projector on, please.

Again, I need to deal separately with site preparation and regeneration. With respect to site preparation, first of all, there is some potential for prescribed burning to result in deposition of organic debris in watercourses. The potential for that to happen depends upon the amount and location of trees

and debris that are left on the site following harvest. The potential is greatest where standing trees; that is, residual trees, occur near the water's edge and are burned.

Now, the amount of debris that enters the watercourse is important. Limited inputs of debris are potentially positive. Again, as I basically covered during the harvest evidence, limited inputs of debris can provide food and shelter for aquatic life. On the other hand, large inputs of debris are potentially negative and that is because large amounts of fine debris may impair water quality and large inputs of large debris can divert stream flow and so cause erosion, it may also block the movement of fish.

Moving to regeneration. I indicated in evidence in Panel 10 for harvest that harvesting along streams can result in a relatively long-term reduction in the supply of organic debris to the stream. Well, regeneration reverses that effect. The growth of new forest does increase the input of debris to surface waters and that reverses the relatively long-term effect of harvest.

Basically, as the new forest grows and ages, greater amounts of debris become available to enter the stream and eventually inputs of debris may

return to levels very similar to those that occurred before harvesting. In general, that kind of effect would be considered positive since debris is often an important source of food and shelter for aquatic life and, as indicated on the slide, may increase habitat for aquatic life. So that is a positive effect.

Q. Can we move on to the next topic of nutrients. When discussing the issue of nutrient input to the aquatic environment as a result of renewal activities, what are the key nutrients that are of concern?

A. The key nutrients are the same ones that are -- were indicated to be important in the harvest evidence; namely, nitrogen, particularly in the nitrate form, and phosphorus.

Q. Are the pathways by which those nutrients enter waterbodies the same as described for harvest?

A. Yes, they are. Just very briefly, for phosphorus the main pathway would be through sedimentation, to some extent inputs of organic debris and, finally, some phosphorus may enter watercourses through the groundwater. For nitrates, the primary pathway would be groundwater simply because nitrates are quite soluble in water.

Q. Does mechanical site preparation have any effect on nutrient levels in lakes and streams?

A. There is very little information on that point. The Blackburn study that I referred to earlier did report increased concentrations of both nitrate and phosphorus in streams following mechanical site preparation and, in both cases; that is, for both nitrates and phosphorus, the more intensive treatment had a larger effect than did the less continue intensive treatment.

However, I'm not aware of any similar studies in Ontario or in jurisdictions with conditions similar to those in Ontario.

Q. Does prescribed burning have any effect on nutrient inputs to waterbodies?

A. Well, it can, but burning differs from mechanical site preparation in some ways. The major way being that burning alters the form of nutrients that are on the site. Burning quickly changes inorganic forms of nutrients to -- sorry, changes organic forms of nutrients to inorganic or mineral forms and those are present in the ash that's left on the site.

Now, these inorganic forms tend to be quite soluble in water and, therefore, are almost

immediately available for uptake by plants, and that could be uptake by terrestrial plants right on the site or it could be by aquatic plants if, in fact, the nutrients in the ash in some way get into a watercourse either by being leached out of the ash and reaching a stream, say, or by the ash itself being carried into a stream.

Now, there have been a number of studies on the effects of prescribed burning on nutrient inputs to streams but, again, most of those studies have been carried out either in the western states or provinces, the west coast, or in the southern U.S., so the results may not be representative of potential effects in Ontario.

Those reports generally indicate that after prescribed burning there is a small increase in nutrient levels and that -- and the duration of that increase may be very brief. In some cases I believe it is a matter of a few days up to several years. So there is quite a variation. But in all the cases that I am familiar with, the levels of nitrates and phosphorus in the streams were low and probably would not have affected water quality significantly, and I say that merely on the basis of comparing the levels reported in the studies to water quality objectives,

particularly those in Ontario.

Something else that's relevant here I guess would be the studies of effects of wild fire on nutrient inputs to streams, and I indicated back in harvest evidence that Schindler studied the effects of a very intense wild fire in northwestern Ontario on nutrient levels on the streams. That study showed that there are increased stream levels of phosphorus, but that there was no significant effect on water quality in the downstream lake.

So basically that study helps to confirm the results of the west coast studies of prescribed burning that fire generally results in relatively low levels of nutrients in water, in surface water at least.

Q. At page 790 of your paper, the last paragraph indicates that regeneration reduces the potential for nutrient inputs to waterbodies.

Now, the Ontario Federation of Anglers & Hunters asked an interrogatory, Interrogatory 14, and requested some information on that subject.

MR. FREIDIN: I would like to file that with the Board at this time, Mr. Chairman.

THE CHAIRMAN: Exhibit 570.

MR. FREIDIN: (handed)

THE CHAIRMAN: Thank you.

---EXHIBIT NO. 570: OFAH Interrogatory No. 14 and answer thereto.

MR. FREIDIN: Q. Could you provide the Board with a description then of both the question and the response which was given?

DR. ALLIN: A. Yes, I'm not sure whether you indicated, Mr. Freidin, whether this was an amended response?

Q. Well, we could probably just advise for the benefit of any of the parties who did receive a copy of the response, this is in fact an amended version of that response which was handed out. It is the only version that the Board will have, but perhaps in your answer -- in describing the answer you could perhaps point out to the parties who are here and who did receive the original what the differences are?

A. Yes, I will try to do that. The OFIA basically asked for details concerning the effects of regeneration on reducing nutrient inputs to waterbodies. And maybe before I get into the substance of the response, I will indicate that this answer was amended in the sense that the numbers, in fact all of the numbers which appear in the response had been changed somewhat.

These numbers all relate to the concentrations of nutrients in streams that have been measured. There's a reference in Nicholson, et al that work was done on phosphorus levels in streams after clearcutting. Those numbers have been changed.

Because of the fact that when I wrote the original reply I was forced to read the numbers off some fairly small figures in Nicholson's paper. Since that time Nicholson sent me the actual data which he used on measurements of phosphorus and so, in the amended response, I used the actual data so that the new figures should be somewhat more accurate than the old.

In terms of the nitrate levels from New Hampshire towards the end of the response, those numbers were changed simply to express the results in terms of nitrate nitrogen in terms of the element nitrogen as opposed to nitrate and I changed those answers I guess for two reasons.

In Ontario nitrate levels are more commonly expressed as nitrate nitrogen and you can obviously express them in either way and diferrent jurisdictions do it in different ways. In Ontario it is more common to express it as nitrate nitrogen and, for example, that is how the drinking water objective

is expressed.

Also the fact that when I presented some nitrate information in harvest evidence, I also used nitrate nitrogen as the form of nitrate so I wanted to be consistent with that. So basically what I am saying is that these are exactly the same data for nitrate, they're just expressed in a different form.

The fact that the numbers have been changed does not at all change the message that's contained in the answer. A number of studies have shown that nitrate and phosphorus levels in streams may increase following clearcutting. It doesn't always happen but in some cases it does. But where it does, the levels decline again as regeneration occurs.

In the case of the phosphorus levels in Nicholson's study, the phosphorus levels declined very quickly in streams. Basically they were back at pre-harvest levels by the second year. In the case of the New Hampshire studies with nitrate, nitrate again declined to control levels. It took somewhat longer, about five years. So basically, over time, regeneration does reduce any increased input of nutrients that reach watercourses.

Q. We move on to the next topic of acidification. In Panel 9 Mr. Armson dealt with the

acidification of soil and potential for increased water acidity due to inputs of acid through groundwater. Can you briefly indicate whether the renewal operations may affect water acidity?

A. There is very little information on that matter. Prescribed burning has been reported to decrease stream acidity; that is, to increase the pH of stream water for a short period of time, but there have been very few studies of the effects of prescribed burning on pH in streams. It has not been measured very often.

In terms of regeneration, regeneration increases soil acidity, as I understand it, basically because the roots of growing trees take up basic materials from the soil; in other words, ions like calcium and magnesium. And at the same time as those basic materials are being taken up, hydrogen ions are excreted from the roots and it is basically those hydrogen ions that are excreted that increases the soil acidity.

The fact that soil acidity increases as trees grow and accumulate biomass means that theoretically there is a possibility that that could lead to increased water acidity as well. But it is at the moment very much a theoretical question and, in

fact, is not known whether this effect actually occurs.

Q. Move on to the next topic of water temperature. What are the potential effects of renewal operations on water temperature, Dr. Allin?

A. Well, prescribed burning may affect stream temperatures in much the same way as harvest may affect them. Where stream-side vegetation including any residual trees is removed, then shade is reduced and stream temperatures may increase particularly in the summer. However, that effect is undoubtedly small compared to the potential effect of clearcutting, but to the extent that it occurs, it may add to the effect of harvest.

I have already indicated in Panel 10 that increased temperatures have variable effects but in terms of cold water fish, they may be harmful. But again, regeneration reverses the effects of both harvesting and site preparation and over a number of years the growth of shrubs and trees near streams does restore shade and reduce water temperature. So ultimately that effect may create better conditions, better habitat for cold water fish.

Q. And I understand - before we conclude your evidence, I have just a couple of matters left - that you wanted to clarify the reference to some

articles that are cited at page 794 of the witness statement?

A. Yes.

Q. And could you indicate where on page 794.

A. Yes. Those references are in the first -- or second full paragraph on page 16. The paragraph that starts:

"Prescribed burning may remove stream-side vegetation."

I wanted to raise this because I wanted to avoid any possible misunderstanding about the way in which those articles have been used in that particular paragraph. The two articles I am referring to are by Lebnow and Rathacker, 1969 and Feller, 1981.

The context in which the articles are cited in that particular paragraph gives the impression that stream temperatures increased because stream-side vegetation was removed by burning, and that is really not the case, at least for the most part.

Both of these studies were carried out on the west coast where oftentimes harvesting results in large amounts of debris, sometimes very large debris getting into streams and that was the case in both those studies. And in both cases that large debris

actually helped to shade the stream there was so much of it.

So looking at those results, the increase in stream temperature that they reported in those studies was primarily due to either burning that in-stream debris itself or to actually removing it by hand which they often do on the west coast.

In other words, the temperature -- stream temperatures increased largely because the in-stream debris itself was removed and so removed the shade that it had provided, rather than the fact that stream-side vegetation on the stream bank was burned.

Now, obviously conditions in both these studies are not very comparable to what might happen in Ontario, but I think the point is still valid. The removal of stream-side vegetation would logically result in the same kind of effect, removal of shade, increases in temperature and in fact Lebnow and Rathacker do point that out.

So I guess what I am saying here is that the potential effects of removing stream side vegetation is a logical effect but these two studies do not illustrate the point very well.

Q. Dr. Allin, how are the potentially negative effects of renewal operations on the aquatic

environment prevented or minimized?

A. Basically negative effects are prevented or minimized in much the same way that potentially negative effects are addressed for harvest. The major tools to do that are the Fish Habitat Guidelines and the Code of Practice. And the way in which those tools are used was described in Panel 10, so I don't intend to go into that again.

Basically, protection is provided by maintaining reserves or areas with only selection cutting within them on lakes and streams and as well by the use of good practice when in fact renewal operations are carried out in riparian areas.

MR. FREIDIN: Thank you, Dr. Allin.

Mr. Chairman, those are all the questions I have for Dr. Allin, but I would like to file as the next exhibit the originals of the photographs which appear in his paper in the witness statement.

THE CHAIRMAN: Exhibit 571.

---EXHIBIT NO. 571: Originals of photographs used in Dr. Allin's paper in Panel 11 witness statement.

MR. FREIDIN: (handed)

Mr. Chairman, I can't finish today and I therefore suggest that we adjourn for the week.

I can advise that Mr. Hogg and Mr. Clark

were the two remaining witnesses. I will probably be able to finish them both up in an hour and a half first thing Monday afternoon.

THE CHAIRMAN: Okay. And if that's the case, will you be ready to go, Ms. Swenarchuk, with cross-examination?

Oh, sorry, Ms. Cronk, I forgot about you.

MS. CRONK: I am not terribly delighted about the fact that you didn't mention me, but in any event I will be ready to go.

THE CHAIRMAN: You will be ready to go. And you indicated that you would be no more than...?

MS. CRONK: No more than half a day, I hope.

THE CHAIRMAN: Half a day, so we may be able to also complete your examination as well maybe on on Monday.

MS. CRONK: That would be possible.

MS. SWENARCHUK: I expect to go Tuesday.

THE CHAIRMAN: Tuesday morning then. Thank you.

And how long do you expect to be, Ms. Swenarchuk? Was it one day?

MS. SWENARCHUK: I think about that, yes.

THE CHAIRMAN: And then you indicated I

think it was half a day, Ms. Seaborn?

MS. SEABORN: Half a day, Mr. Chairman. I will of course have to wait and hear my friends' questions first, but I don't anticipate any longer than that.

THE CHAIRMAN: And re-examination probably won't be really extensive with this panel; will it?

MR. FREIDIN: I have no idea. It depends upon the questions and the answers.

THE CHAIRMAN: I wonder what we are going to do if we finish early. We haven't heard from OFAH at this point and I have instructed Mr. Mander to find out from him today whether or not they intend to cross-examine.

I take it there's going to be no cross-examination from Mr. Hunter or Mr. Colborne, Mr. Reilly or any of the others that we have heard about. We haven't heard of any and I don't know if counsel knows of any.

MR. FREIDIN: Well, I think perhaps the best thing to do is just proceed on next week and see how things go. There may be some matters that we will want to address the Board on in any event. I think we will probably fill up most of the week.

THE CHAIRMAN: All right. In the event that we do finish earlier or it appears we are going to finish off earlier, would it be possible for counsel to give consideration some time next week to some of the matters we discussed yesterday with respect to the community visit, and then perhaps towards the end of next week come back to us with any suggestions or compromises that may have been worked out instead of taking up the time the following week to deal with them?

MR. FREIDIN: I think that might be a useful use of the time. I understand that Ms. Swenarchuk has some problem.

MS. SWENARCHUK: Mr. Chairman, Mr. Lindgren and I are not able to be here next Thursday.

THE CHAIRMAN: Oh, you're not going to be here next Thursday.

Well then, perhaps then we will that leave that discussion to the following week, since I think it was your objections that were somewhat different from the positions of the other parties.

MS. SWENARCHUK: Well, Mr. Chairman, I am not aware of what counsel were involved in the proposal that Ms. Cronk made so...

THE CHAIRMAN: Sorry.

MS. SWENARCHUK: I am not aware of how many counsel or which counsel were involved in the proposal Ms. Cronk made.

THE CHAIRMAN: No, I know. I didn't mean that, that there is agreement by anybody, but there are one or two positions that were indicated to the Board yesterday and they are at variance with each other to some extent, so we thought it might be helpful if counsel could get together to see if some of those concerns amongst counsel could be resolved and then approach the Board with the common position, if possible. And, if not, then we will have to take into account all of the comments and indicate what the Board intends to do.

MS. SEABORN: Mr. Chairman, perhaps Mr. Mander could let me know if he speaks with someone from the Federation because it's obviously our cross-examination that will be affected in terms of timing if the Federation intends to...

THE CHAIRMAN: I will have him get back to you either later today or tomorrow because we feel in this circumstance, especially when it comes to scheduling that we should be entitled at this stage of the game to know which parties intend to cross-examine and get an estimate from those parties how long they're

going to be.

MR. FREIDIN: Perhaps Mr. Mander could advise me as well?

THE CHAIRMAN: So if OFAH cannot tell Mr. Mander today then we are going to indicate that we are going to proceed with whatever comes next.

We just don't feel it's fair to both the Board and the other parties not to be apprised ahead of time as to who intends to take up the Board's time with cross-examination, since that can often occupy anywhere from a short period of time to several days.

We will adjourn until one o'clock on Monday.

Thank you.

---Whereupon the hearing adjourned at 1:25 p.m., to be reconvened on Monday, May 15th, 1989, commencing 1:00 p.m.